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[625 .258 (.44) & 656 .259 (.44)]

Appliances for braking wagons in marshalling yards controlled from a distance, [1]

By L. CADIS,
ASSISTANT ENGINEER, PERMANENT WAY MATERIAL OF THE MIDI RAILWAY OF FRANCE.

Figs. 1 to 11, pp. 1064 to 1072.

For some time the Midi Railway Company has had under consideration the automatic braking of wagons in marshalling yard sidings.

The different arrangements tried out during the investigation will not be described. The problem is now considered to be solved for all conditions that may arise and which in practice are covered by the two following :

1. Braking the wagons at the top of the hump;
2. Braking the wagons on the sidings where they are usually stopped by the hand brakes.

Two equipments which meet each of the above requirements have been put into use in the Company's yards at Narbonne and Bordeaux.

1. Installation at Narbonne.

End in view. — Wagons are marshalled in the yard at Narbonne by shunts made in an East to West direction, whilst the prevailing wind, which is usually very high, blows from West to East.

The result is that a wagon which, in calm weather would run to the far end of the marshalling sidings, will in windy weather only just clear the points. To get satisfactory results in all cases it would be necessary to increase the height of the hump to overcome the effect of the wind, and to reduce the speed of the wagons off the hump in calm weather. The difficulty was met by increasing the height of the hump and by installing braking appliances made to the Company's requirements by Messrs. Trayvou

(1) Translated from the French.

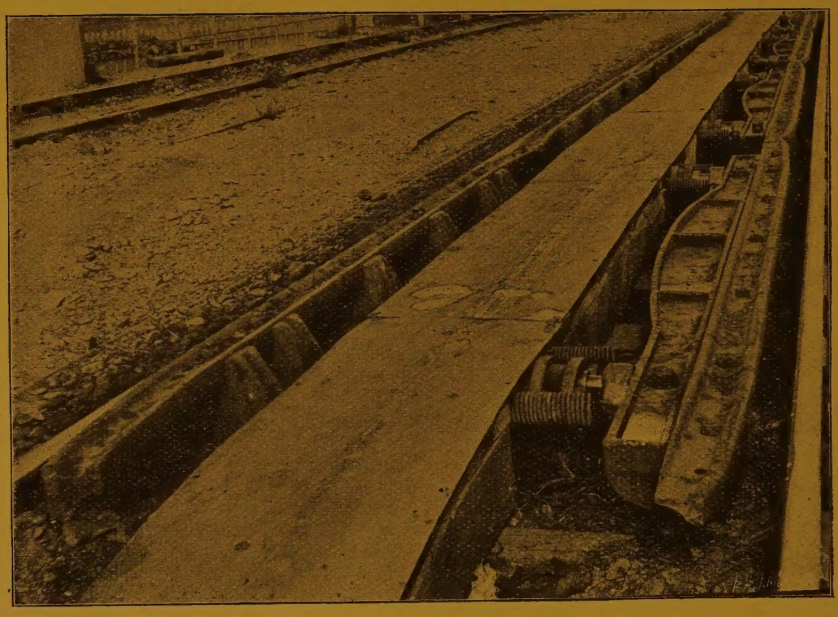


Fig 1.

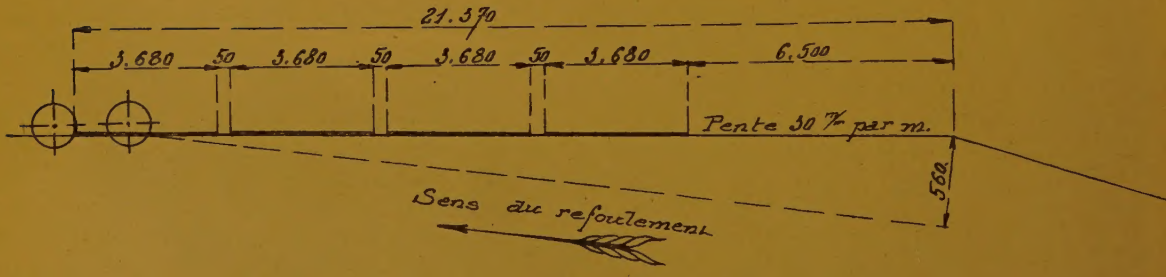


Fig. 2.

Explanation of French terms: Pente 30 m/m par m. = Slope 1 in 33. — Sens du refoulement = Direction of shunting.

of Lyons. These equipments have been in use since 1922 and are illustrated in figure 1.

Description of equipment. — Each set of rail brakes is 3.680 m. (12 feet) long and is hydraulically controlled. It consists of two check rails : one fixed and the other moveable. When the gear is out of use, the overall distance apart of the two check rails is 1.350 m. (4 ft. 5 5/32 in.). When the moveable rail has been displaced by the two motors to which it is attached, the above distance is increased to 1.390 m. (4 ft. 6 3/4 in.).

As tyres are usually 1.360 m. (4 ft.

5 9/16 in.) apart, the moveable rail has to be pushed back 30 mm. (1 3/16 in.) before a wagon can pass. The reaction at the motors due to this movement is limited to 3 000 kgr. (6 614 lb.) which is well below that which might cause the wheels to mount the rails.

Thirteen years' experience has shewn us that this pressure is quite sufficient and that it has not given rise to any trouble.

Adjustment. — So that the effect of the slope of the hump may be controlled as desired, four sets of rail brakes have been installed at distances apart of 50 mm. (2 inches) as shewn in figure 2. The appliances are so set that whilst a wagon can be checked, or even stopped so long as its four wheels are in contact with one or other of them, it will start moving again as soon as the check rails act on one pair of wheels only.

Results obtained. — When the distance between the last set of rail brakes and the top of the hump, and the latter's slope, are taken into account, the effective height of the hump would be reduced by about 56 cm. (1 ft. 10 in.) if it were only possible to release the wagon when it got to the last appliance. As each set of rail brakes can be operated independently, any wagon can be released as the shunter wishes and the effective height of the hump diminished in consequence as desired.

By means of this installation trains can be remarshalled in all weathers without difficulty and without damage.

A test of this rail brake in the part of the sidings set aside for checking the wagons by the hand brakes is being made at the present time. The first results obtained have been most encouraging.

2. Installation at Bordeaux.

At Bordeaux the hump near signal box No. 6 was hardly high enough even in the most favourable weather to give the wagons sufficient speed. As soon as Winter set in, gangs of labourers had to be set on to push wagons clear of the points.

Owing to the small space into which the many points at the head of the marshalling sidings are crowded, it was not possible to increase the height of the hump and brake the wagons at the top of it as at Narbonne. It was consequently necessary to get out an arrangement which, whilst allowing the wagons to clear the points into the sidings, would allow their speed to be checked as soon as they were clear of the points.

The requirements were met by providing, either in front of certain points, or on a line with the sleepers indicating the safe limit of the siding, brake skates mechanically operated from a control post.

Description of the apparatus. — The apparatus in use, known as « Midi brake skates, 1925 pattern » was first tested on the centre lines of the yard as shewn in figure 3.

Each apparatus consists of a skate attached to a thimble, the lower part of which is grooved and slides on a guide rail.

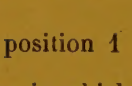
The top of this thimble slides on a tube to which two springs each 50 cm. (1 ft. 7 11/16 in.) long are fitted. The ends of the tube are fixed to the guide rail.

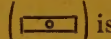
The lower part of the thimble also carries a tappet cast on it which, at the end of the stroke, comes up against a displacer bolted up to the running rail. A spring fitted at the end of the appa-

ratus allows the guide rail to move at the moment when the skate, owing to the tappet and the displacer coming in contact, is withdrawn from beneath the wheel of the wagon.

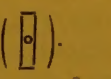
Figures 4, 5 and 6 shew the arrangement of the apparatus which, except for the springs and the frame carrying them, is built up from ordinary track material.

Control. — The whole of the appliances are operated from a central brake cabin (fig. 4) in which there are two racks. Each rack carries a number of small three-position levers of which :

position 1  is the ready position in which the skate is against the rail but without current at the motor;

position 2  is the position with the skate on the rail.

When the brake operator wishes to remove a skate he has already put on the rail, he places the lever in :

position 3  .

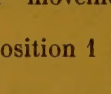
After each movement the lever is returned to position 1  .

Figure 4 shews the position taken up by each apparatus when the skate is against the rail. Figure 5, on the other hand, illustrates the position of the skate on the rail when the operator has placed the small control lever to position 2.

Working the apparatus. — As soon as a wheel comes against the skate, the latter slides along the rail, and, at the same time the thimble compresses the springs it comes up against during its movement. Towards the end of the apparatus the tappet, owing to the displacer, moves towards the right (fig. 6) withdrawing the skate from beneath the wheel. It takes the guide rail with it by compressing the end spring.

As soon as the wheel is clear, the springs in the frame return the skate to its starting point, and the end spring restores the guide rail to its original position before the skate was withdrawn. The apparatus is then ready to act again.

This would take place if it were desired to brake every pair of wheels : it has been found in practice that there is not always sufficient time between the passing of two successive pairs of wheels for the skate to return to its original position. Consequently it has been considered preferable to brake only certain of the wheels but for the full length of the appliance. In view of this, an arrangement has been got out in which the gear automatically takes up the position « skate alongside the rail » as soon as the brake skate has been withdrawn from under the wheel. The modification consists in attaching a tongue to the thimble of the skate which, as the skate moves, comes up against the arm of a switch and closes the control circuit of the motor, thereby reversing its movement. The apparatus starts to move back as soon as the effort exerted by the motor is sufficient to stop the sideways movement of the skate by the displacer.

Repeated brake applications. — Each appliance allows a pair of wheels to be braked for a distance of 7.500 m. (24 ft. 7 1/4 in.) and as the skate is released automatically without any action by the brakesman, the latter can, when dealing with a rake of wagons, replace the skate to brake a second pair of wheels of the same rake for the distance of 7.500 m.

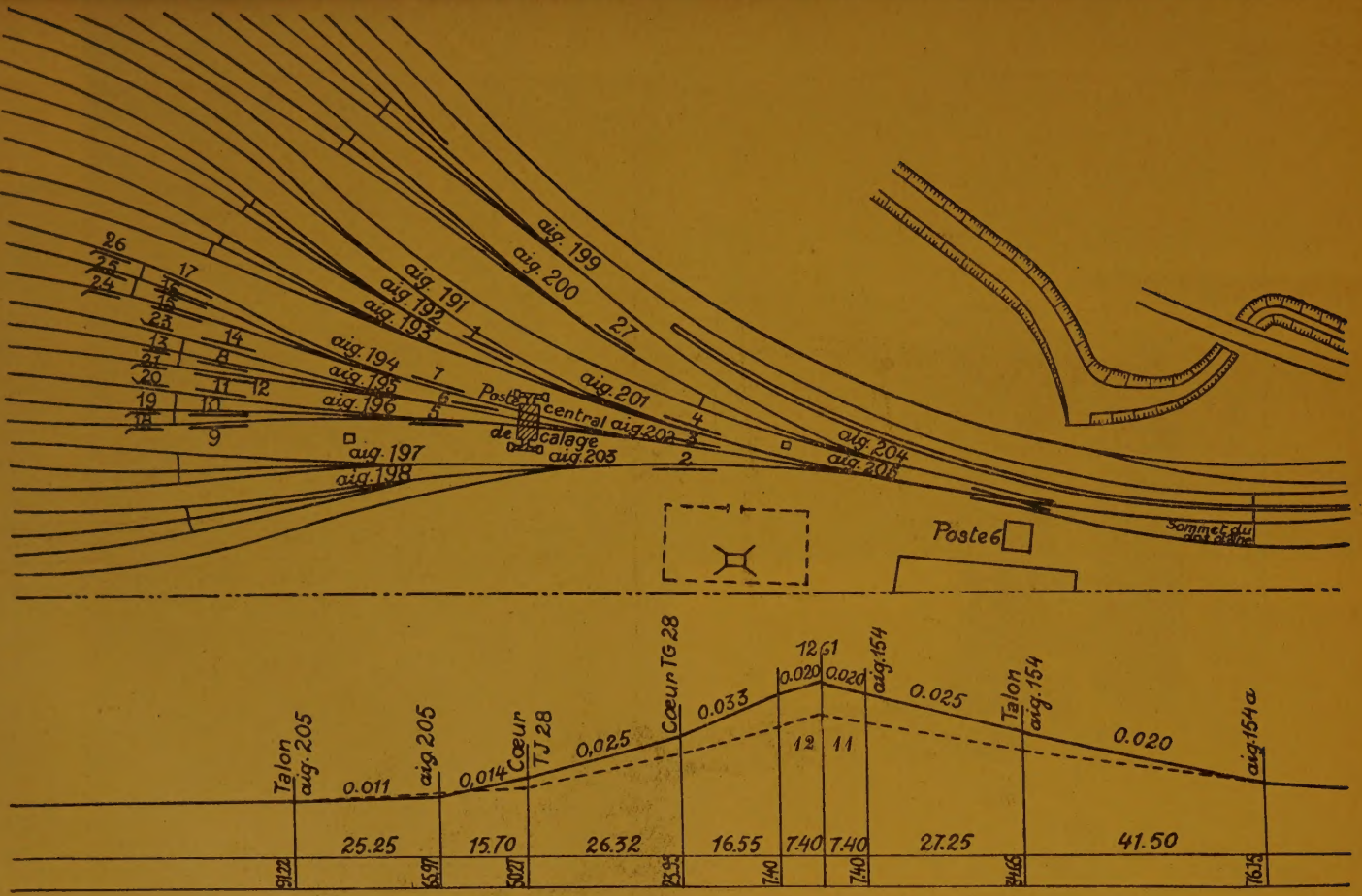


Fig. 5. — Bordeaux-Saint-Jean yard. No. 6 box.

Explanation of French terms: Aig. = Point. — Poste central de calage = Central brake cabin. — Sommet du dos d'âne = Top of hump. — Talon = Heel of switch. — Cœur = Heart.

Fig. 4

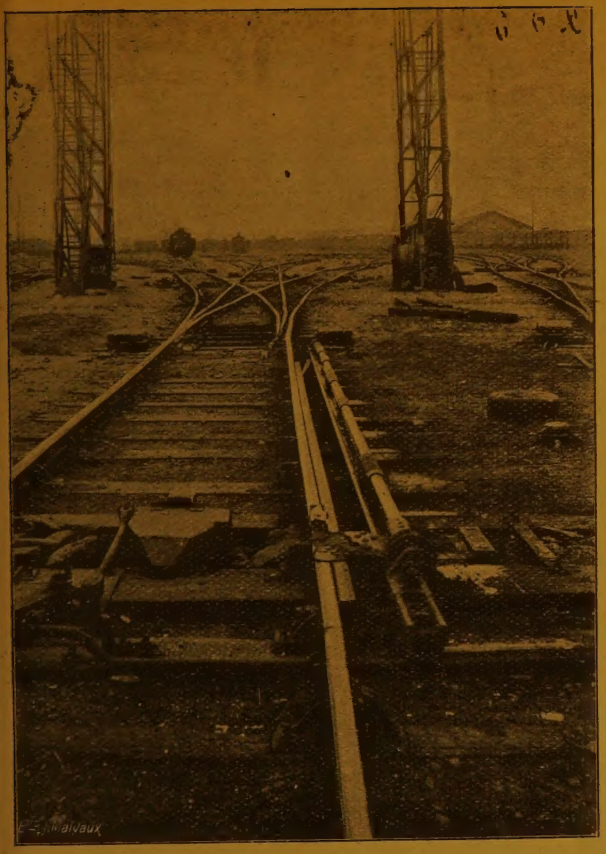


Fig. 5.

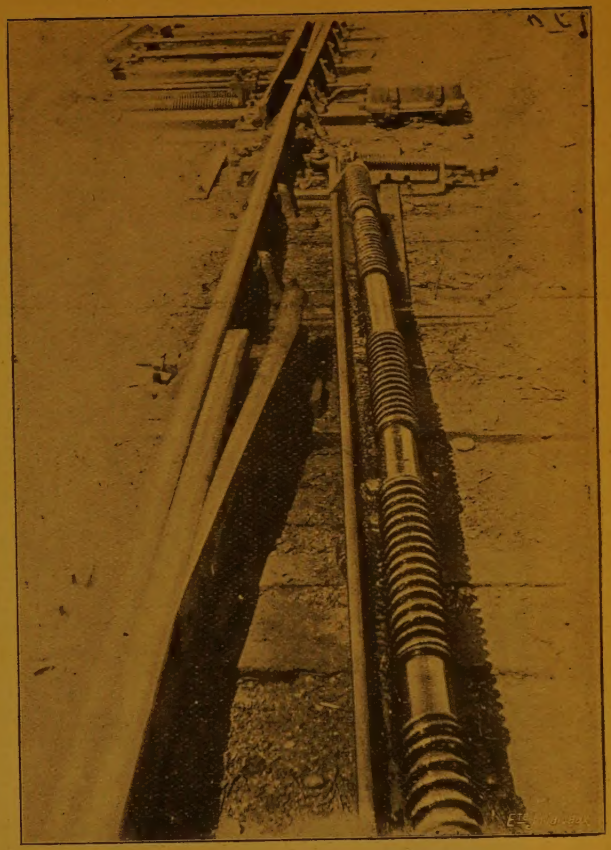


Fig. 6

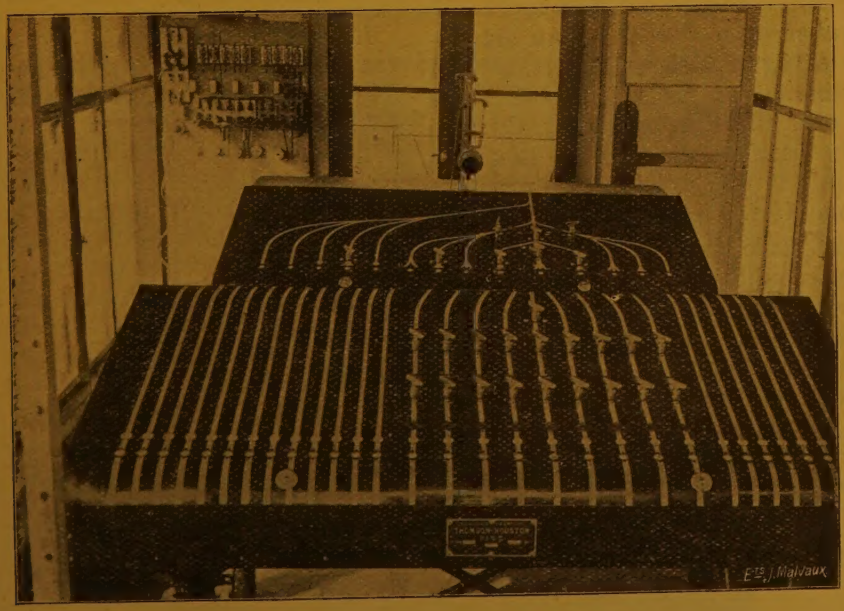


Fig. 7.

(24 ft. 7 1/4 in.) mentioned above. Usually a rake of three wagons with axles spaced at 3.400 m. (11 ft. 1 7/8 in.) can be braked twice.

In order that this may be done independently of the brakesman, the control of the motor in some of the appliances has been so arranged that, so long as the handle remains in position 2, the skate, after withdrawal, is automatically replaced upon the rail when it has been returned to the position shewn in figure 4.

Removal of the skate. — When the brakesman does not wish the skate to be replaced on the rail automatically, he puts the handle to position 3, and then to position 1. If the brakesman, after having placed the skate on the rail, considers the wagon need not be braked just as it approaches the skate, he can readily withdraw it. The apparatus is very flexible as the brakesman can at will place the skate on the rail or remove it, and can also automatically brake several pairs of wheels of a rake.

Equipment of a track. — An examination of figure 3 shews that, on each of the nine centre roads of the yard, the only ones fitted up completely, the brakesman has four sets of gear : three long 7.50 m. (24 ft. 7 1/4 in.) and one short 4.50 m. (14 f. 9 5/32 in.).

Tests made prior to September 1925 (a period when the wagons ran well, as the wind was in the right direction) shewed that it was rarely necessary to use all the 4 appliances; in every case in which it was, the speed of the vehicles after the last braking was so low that the force with which they hit the standing wagons was insufficient to damage either the stock or their loads.

Apparatus with set-off guide rail. — In the first installation put down, apparatus of simpler construction, so far as the number of parts was concerned, was tested. It was less reliable in operation in that it could not be relied upon to return the skate to its starting point.

The rod guiding the skate was offset towards its end, and the thimble of the skate moved outwards as it followed the set-off. The set-off interfered with the release of the springs, and, as a consequence, with the return movement of the skate. As it is important that the brakesman should be able to make use of the full braking power of the appliances, the long appliances have been straightened, only the short offset appliances being left in service as they did not give rise to the same trouble (fig. 9).

So as to keep down the number of spare parts, only the long straight appliances will be made in future. By limiting the length the skate is moved, it is always possible to reduce, should it be necessary to do so, the length the last appliance brakes the wagon.

Illuminated indicators. — In order to complete the equipment of the yard, illuminated indicators have been provided from which the brakesmen in the cabin, and the men in the sidings who use the hand brakes, can see on to which line the wagons about to pass over the hump will be sent : the indications are given automatically by the pointsman in No. 6 box.

This box is electric with route levers. When the pointsman moves a lever, a series of switches and relays light up lamps on the two diagrams in the brake cabin (at the end of the groups of sidings or of the sidings affected shewn on the board) and on an illuminated board on the structure carrying the brake cabin (fig. 10).

In this way the brakesmen in the cabin

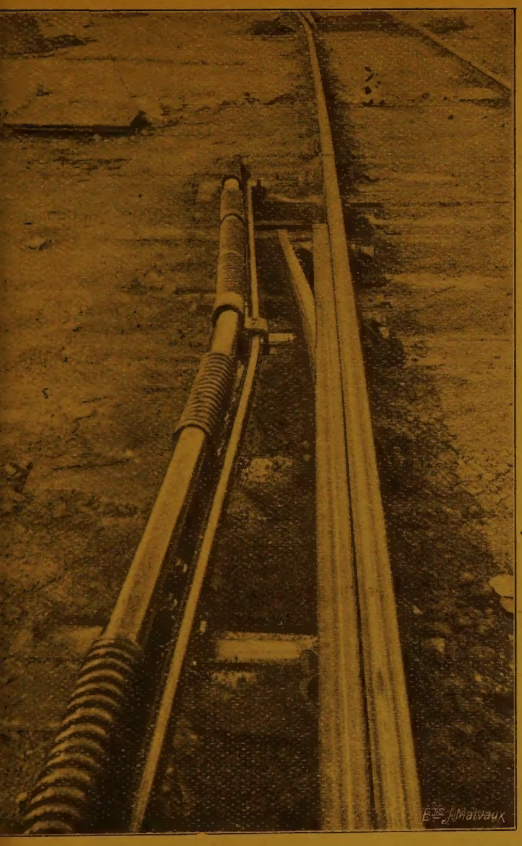


Fig. 8.

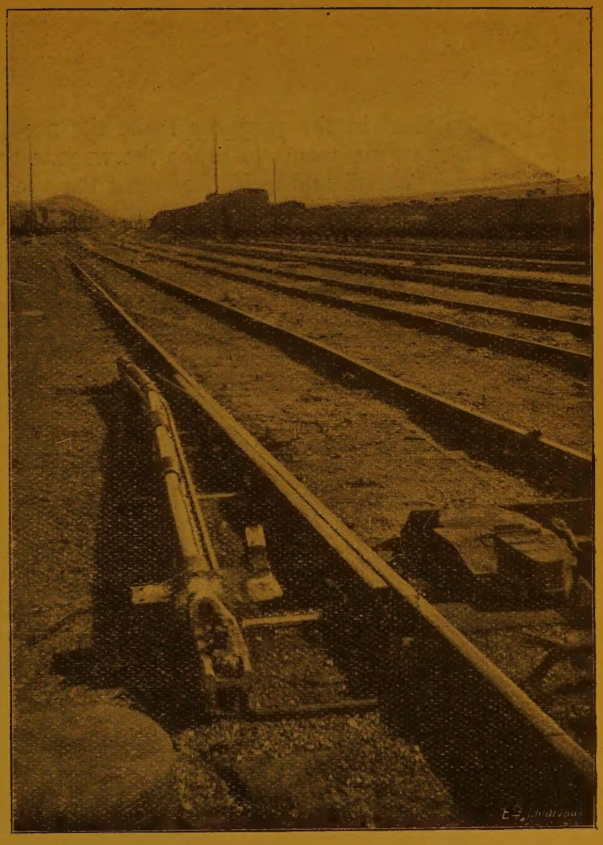


Fig. 9.

Fig. 10.

and in the yard can make the necessary arrangements to brake the wagons as required, taking into account the speed of the wagons and the holding capacity of the sidings they control.

Siding indicator. — On the board in the foreground of figure 7 there is a row of green lamps placed between the levers and the lamps already mentioned, for the nine middle roads of the sidings. The

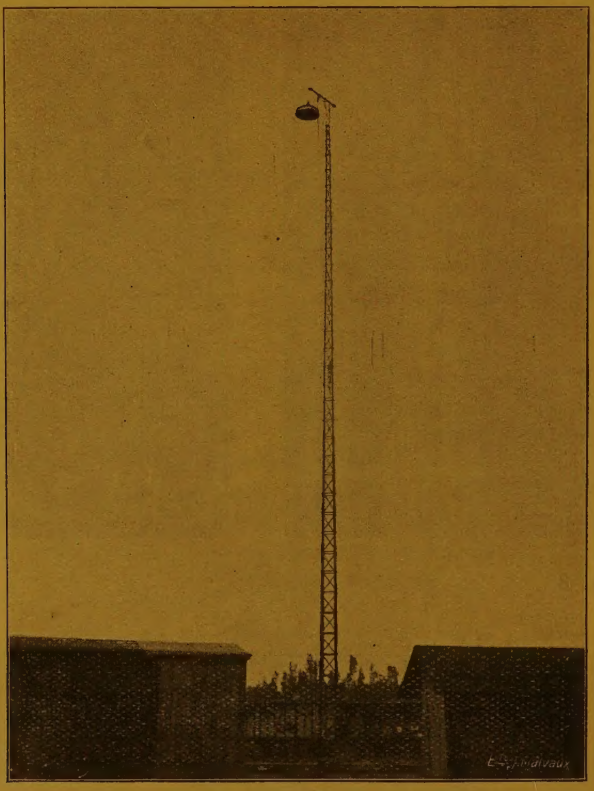


Fig. 11.

lamps work in conjunction with track circuits and indicate in the brake cabin, wagons passing into the sidings and wagons standing too long at the points; the indications are especially useful during foggy weather. In the latter case, the sidings may be full; the brakesman's duty is to ascertain the actual case.

If they are, the pointsman in No. 6 box is advised by means of a loud speaker, the trumpet of which can be seen over the table in the background of figure 7. The telephone could not be used by these two employees who may not leave their posts whilst shunting is in progress, even should they wish to communicate with one another in the interest of the service.

Finally, in order to facilitate braking

and shunting operations, it may be mentioned that the following additional equipment has been installed :

Lighting. — 1. The lighting of the sidings was entirely remodelled — powerful lamps (3 000 to 4 000 candle power) were provided, carried on columns 25 to 28 m. (82 to 92 feet) high (fig. 11). The results have been very satisfactory.

Audible Signals. — 2. Three motor driven Klaxons were fitted alongside the shunting neck. By means of a code of signals, such as those used with electric bells, the pointsman in No. 6 box near the top of the hump by means of a button on the table in the box, gives the driver the following orders : move forward, set back, accelerate, slow down, stop.

The Klaxon motors take current at 110 volts.

ADVANTAGES

With the equipment now in use (fig. 3) the following advantages have been obtained :

Wagons shunted. — The number of wagons shunted per minute has increased from 6 to 9.

Staff. — The gangs required during severe cold to move wagons clear of the points have been suppressed. As many as 20 men were required during the 24 hours.

Taking the yard as a whole, the number of brakesmen on duty at the same time has been reduced from 15 to 11. The post of assistant head brakesman has been abolished. As two brakesmen are required in the box, the saving in permanent staff has been $(4 + 1) - 2 = 3$ per shift of 8 hours, that is, a total saving of 11 men, when two relief men no longer needed are included.

When the thirty sidings in the yard have been equipped, the number of men will be reduced in a still higher proportion (about 50 %).

Damage. — So far as damage to stock is concerned, the brake appliances on the nine centre roads have not been in proper working order long enough for statistics to be compiled of the savings effected owing to the few cases of rough shunting that now occur on these lines : they are expected to be considerable.

Bordeaux, 10 May 1926.

[624. (01].

Results of tests of metal bridges in Russia from 1919 to 1924.

This note is an abstract from a more detailed article Professor Streletzki of Moscow published in the *Eisenbahnwesen* under the title « Die Eisenbahn technische Tagung und ihre Ausstellungen ». V. D. I. Verlag, Berlin, 1925. The article contains much interesting information on the experiments carried out on Russian bridges, and is a definite contribution to the study of the dynamical coefficient (impact) in railway bridges.

* * *

As it has been impossible to renew the railway bridges in Russia regularly during recent years, it has been necessary to overhaul them very carefully to ascertain their real state of repair.

The tests were arranged and carried out by the Scientific and Technical Committee of the Commissary of Communications. Between 1919 and June 1924 many bridges have been tested, and the results collated at three centres, Moscow, Leningrad, and Kieff.

The programme of the work was as follows :

1) *Examination of the vital defects in the structures;*

2) *Determination of the static stresses (zero speed);*

3) *Determination of the dynamic effect of moving loads and the relative effect of different types of locomotives.*

I. — Defects in the structures.

The investigation brought out in particular the influence of the *longitudinal profile* of the structure.

The form of this profile depends upon the age of the structure and the care taken during erection.

In the case of modern structures the profile is generally convex towards the top. In the case of structures thirty or forty years of age the profile shows signs of downward yielding at the supports. As its age increases the profile became concave towards the bottom. The reason of these changes is to be sought in *a gradual deformation due to shocks at the supports and in the raised part at the centre.*

So far as the metal is concerned, *a falling off in the elasticity and in the fatigue limits was noted, as well as a reduction in the ductility and in the elastic limit.* These observations are particularly noticeable when tests of test pieces taken from fatigued parts, such as the main members, are compared with the results of tests from test pieces cut from members less stressed, such as the top wind bracings. The metal in the former parts is much more highly stressed than in the latter. These differences furthermore increase with the age. Irregularity in the longitudinal profile produces unequal stress in the girders. This lack of symmetry is also increased by the connections of the various details yielding.

Irregularities in the plating work also alter the work done by the girders. These defects are usually due to errors in erection.

An important point is that *the expansion rollers ultimately take up an oblique position* which accentuates proportionately the work on the slides and may even cause cracks to develop.

The rail joints sometimes increase the pressure by as much as 30 % — this increase always reaches an average of 10 %. The joints of rails on the bridge floor structure are now most carefully maintained in Russia.

11. — Determination of static stresses.

Stresses determined experimentally are always less than those calculated, the ratio — factor k — between the real stresses and the calculated ones, supposing the girders to have theoretically perfect pin connections without friction, is < 1 for 90 % of the railway bridges — 220 bridges having been tested in June, 1924.

In the case of bridges with side girders with the track carried below, the mean value of $k = 0.88$ for the upper main member, 0.73 for the lower main member, and 0.78 for the diagonals (220 bridge girders).

These values of k vary with the kind of bracing. For *girders with the usual cross triangulated bracing* (Dreieckfachwerk) the mean values of k are : 0.67 for the lower member, 0.81 for the upper member (56 bridges); for *built-up lattice girders* (Mehrteilige Strebenfachwerk) $k = 0.71$ for the lower member and 0.90 for the upper member (37 bridges); for *girders with multiple diagonals* (Netzfachwerk), $k = 0.74$ for the lower member and 0.83 for the upper member (35 bridges).

Deviations from these mean coefficients show that the structure is defective. *The values of « k » increase with age.*

When going from the simple triangulated system to the lattice girder the coefficient k increases, this increase being largely due to age through the loosening of the connections. *In course of time the girder tends to function like a calculated articulated girder.*

The values of k for railway bridges with side girders and the track carried below are smaller for the lower members than for the upper ones, the relative difference amounting to as much as 15 %.

The principal cause of this difference is to be found in the reinforcing of the lower member by the work done by the plating, and also through the supports being insufficiently mobile. This latter effect in skew bridges may amount to 40 %.

The longitudinal stresses supported by the longitudinal stringers reduce the load on the lower members of the trusses more and more as the stringers are stronger and more rigid. This effect is therefore more noticeable in recent structures.

When the track is carried above the girders the work done by the plating reduces the load on the upper members, but to a less extent than occurs in the previous case with the lower members.

The average value of k is 0.77 for the upper member and 0.81 for the lower (41 bridges).

The values of the coefficient k for *the diagonals are also* < 1 (93 % of the tests — 101 bridges). In the case of new floor structures with large gusset joint plates and large sections, k is smaller than it was with the older floor structures, and especially in the case of loose diagonals where k may be > 1.

With age the work done by the diagonals *tends also to become equal to that with frictionless articulated joints.*

For the verticals k is usually much less (average 0.57).

The *secondary strains* in the Russian bridges are fairly high, and particularly so in the webs of the main members — mean value 0.57 of 870 observations. In the flanges the phenomenon is less marked. *The secondary stresses* are not principally caused by the stiffness of the gusset assembly plates, but are rather due to irregular distribution of the ten-

sions throughout the transverse section of the element.

For this reason there is little variation in the relative value of these tensions in spite of the many types of lattice in use.

Furthermore, *the secondary tensions vary inversely as the principal tensions. The coefficient « k » on the contrary increases with the principal tensions.*

The riveting plays an important part in the distribution of the stresses. The load on the rivets is more evenly distributed as the pressure increases, and in consequence the coefficient k increases and the secondary tensions diminish.

It is of interest to note that this phenomenon is more marked in the case of new floor structures where the metal is ductile than in old floors where the metal has lost some of its ductility.

On investigating the *work done in the longitudinal stringers,* it has been seen that when they are considered as girders on two supports, the coefficient k has a low value, 0.6, whence it is < 1 (35 tests). On the other hand if the girder be considered as a continuous girder the coefficient is > 1. These elements should then be considered as partially built in : the stresses agree best when calculated from the formula

$$M = 0.08\ Pl^2.$$

The load taken by the longitudinal stringers is largely influenced by *the torsion in the cross girders* of the bridge, so much so that in some cases the sign of the bending stresses in the lower flange plates can be reversed and the plates be in compression instead of tension.

A study of *the bending of the bridges* reveals that it depends largely on the type of lattice used, and that different cases cannot be compared.

If α be the coefficient of deformation :

$$\alpha = \frac{\delta h^2}{pl^3},$$

when

δ = bending;
h = height of girder;
l = length;
p = load;
$\alpha = 0.00036$ for new structures with simple triangulation,

and

$\alpha = 0.0003$ for old floor structures with multiple lattice work.

Girders with multiple lattice work are therefore stiffer than those with simple triangulation.

III. — **Dynamical effect of loads.**

The dynamical effect of the loads is due to the following causes :

1) Blows due to speed on badly laid track or to wheel flats;

2) Influence of speed on well laid road causing a displacement of the point of application of the moving loads;

3) Variation in loading due to variation of steam pressure in the cylinders and to imperfect balancing of inertia forces.

These factors give rise to rhythmic vibrations in the floor structure which generally give rise to an increase in the static loading.

The *dynamic coefficient,* incorrectly called *coefficient of shock,* is usually greater than unity.

In the case of bridges in Russia, this coefficient can be expressed by the hyperbolic function :

$$i = 1 + \frac{2\,100}{1\,000 + l^2}.$$

The curve has ordinates of lower values than in the European curves which is explained by a lower normal speed [< 50 km. (31 miles)].

The *dynamical coefficient* decreases rapidly when the span of the bridge increases; that is explained firstly because the influence of shocks diminishes with the length and the weight of the floor structure, and also because the number of axles on the floor structure being greater the phases of the oscillations oppose one another and the synchronisation of the vibrations diminishes.

The dynamic coefficient is a function of the speed. The effect of speed is seen in :

1) Shocks on badly laid track;
2) The setting up of vibrations due to the movement of the loading on well laid track.

On the Russian lines the first factor — shocks due to rail joints, flats on wheels, irregularities in the longitudinal plane — is very important. The shocks increase the dynamic coefficient — coefficient of shock : as this is a function of the speed, the energy in the blow increases.

The second factor increases or diminishes the dynamic coefficient as a function of the speed, as it depends upon the periods of the oscillations of the floor structure, changes in loading, the type of floor structure and its state of repair.

The theoretical calculation of the deflections made by Dr. Saller show that with an increase in speed the dynamic coefficient can be reduced : this has often been found empirically. He has noticed an interesting feature *namely the delay of the deflection relative to the position of the load*, — the deflection is out of phase and is delayed in relation to the load.

This delay or out-of-phase effect comes from the displacement of the points of application of the load and depends also, though not equally, on the state of repair of the floor structure. By comparing the theoretical diagram with the diagram obtained by experiment we may be able to reveal a defect in the floor structure in question.

This comparison involves much labour : the calculation and preparation of the theoretical diagram take time. Nevertheless, the theoretical diagram being the line of discontinuous influence of the group of forces, its area can be determined easily enough by multiplying the area of influence by the integral of the group of forces :

$$F_D = F_l \int_o^{\lambda+l} pdl.$$

Where

F_D = area of the diagram ;
F_l = area of influence ;
λ = length of train ;
l = span of the floor structure ;
p = weight of the train ;

For floor structures of large span, where p = constant, we can write :

$$F_D = F_l \Sigma p$$

Σp being the sum of the static loads on the section $\lambda + l$.

The ratio of the area of the empirical diagram to that of the theoretical diagram is the *coefficient of area* or coefficient F. Its value depends essentially upon the condition of the structure, and can therefore be considered as the *index* of this condition.

The number of structures tested so far has not been very great; the method used for arriving at the coefficient F appears capable of many interesting applications.

As has been said above, the *dynamic coefficient* depends doubly on the speed —by the action of shocks and by it being out of phase, and this latter makes the coefficient vary most irregularly.

At high speeds of from 60 to 100 km. (37 to 62 miles) an hour, the effect of shock becomes more prominent than the effect due to the lack of phase, and the

dynamic coefficient is a function increasing with the speed.

The critical speeds and phenomena of synchronised vibrations are only ascertainable in the case of medium and long span structures where the dynamic coefficient is already fairly small.

When in synchronism the vibrations due to the driving wheels of a locomotive E for a bridge of 87 m. (285 ft. 5 1/4 in.) span at the speed of 40 km. (25 miles) an hour give a dynamic coefficient of 1.25, 12 % higher than the normal value for this particular case.

The synchronised vibrations caused by the successive movement of a number of pairs of wheels of goods wagons over a rail joint give a dynamic coefficient of 1.1 to 1.15.

As a matter of fact, the dynamic coefficient of the bridges in Russia is not very high. It is found to be a little higher in the main members and the diagonals owing to there being some play at the joints. For structures in very bad order with plating in poor condition, the coefficient has been as high as 3.

The dynamic coefficient also depends upon variations in the moving loads, which in turn depend upon the type of locomotive, of the trains hauled, and the state of repair of the locomotive.

The coefficient diminishes with the number of axles in question. Experiments showed that the dynamic coefficient of a single locomotive is usually higher than that of a train, locomotive and wagons (2 000 tests). With the same weight of train, when the axle loads and spacing are the same throughout the train, the result is worse than when these factors are not the same.

The dynamic action of the locomotive depends principally on the type, the balancing of the driving wheels, and the motion, so that the results obtained with locomotives are very varied. Professor Lomonossof, Chief Engineer of the Russian Locomotive Office, has prepared polar diagrams showing the dynamical variations in the loads due to these factors according to various hypotheses, and for both the left and right hand wheels of a single pair.

In this way the effect of different locomotives on the floor structure can be examined. Four types of engine were tested on the same bridge, series D., *Prairie* 1C1, *Pacific* 2C1 and *Consolidation* 1D.

The test was more particularly of the longitudinal girders and was carried out chiefly with the *Prairie* and *Pacific* types with which the dynamic action is greatest at high speed.

The tests are not yet completed, but it is already possible to deduce from them certain interesting facts.

The first conclusion notes the rapid increase of the dynamic coefficient with the speed (6 000 tests).

Speed is the principal factor so far as the longitudinal girders are concerned. At high speeds the dynamic coefficient may reach high values — up to 5 — and usually greater than 3. Although the static fatigue corresponding to this may be rather small, it is necessary to keep in mind that it will be increased by 1.5 to 2 on an average.

When comparing the dynamic effects of different locomotives on the same bridge, it will be seen that the maximum effects are given with a type D locomotive pulling a heavy train with maximum cut off.

The *Prairie* and *Pacific* locomotives give mean figures almost identical. The goods locomotives 2D with moderate counterbalance in the driving wheels and which run at moderate speeds show reduced effects.

The dynamic coefficient is high : it reaches 3 in parts lightly loaded, can be 5 at high speed and 2 in parts heavily loaded.

The action of the counterbalance should also be kept in view. Nevertheless, and contrary to the apparent indication of the American tests in 1907, the influence of this factor is not to be compared with that due to speed.

From the tests we can conclude that the influence of the point of cut off is small: it affects chiefly the transverse vibrations of the floor structure. Running in full gear may increase these vibrations 20 % which is explicable by the similar increase in the reactions due to hunting. The effect of synchronised vibrations is greater in the transverse direction than in the vertical.

So far as these vibrations are concerned, the type D is the worst. After it comes the *Prairie* 1C1 and the *Pacific* 2C1.

The tests which have enabled these conclusions to be arrived at were carried out over a period of six years using Leuner instruments.

March 1926. R. Desprets.

[621 .133 & 621 .137 1]

Removal of clinker from locomotive fireboxes, (1)

By Professor A. DE PAWLOWSKI,
DELEGATE OF THE POLISH STATE RAILWAYS AT THE INTERNATIONAL RAILWAY CONGRESS, LONDON.

Among the questions dealt with at the tenth session of the International Railway Congress held in June 1925 in London, the economical use of fuel was discussed with considerable interest.

The fire-grate may be considered as one of the most important details in the efficient use of fuel from two independent points of view. In the first place it may be regarded as the lungs of the locomotive through which the air necessary for combustion is drawn in the required quantity and uniformly distributed. By choosing a suitable arrangement of grate of sufficient length and breadth, and slope, this part of the problem may be solved in a satisfactory manner. On the other hand, in order to ensure that the fire-bars, etc., shall have a reasonable life, it is necessary to provide that they shall be kept reasonably cool.

When one is dealing with solid fuels which produce a considerable amount of incombustible matter, as in the case of coal, where these residues become fused together and form clinker, it is necessary that the grate shall be so designed that, in addition to the conditions mentioned above, it shall be possible to remove these products which hinder combustion. It is also necessary that the grate shall be arranged so that the clinker and ashes shall be easily and readily removed.

The troubles which arise if clinker and ashes are not removed completely are as follows :

a) If the layer of clinker on the grate is allowed to increase, this prevents air from entering through the spaces between the bars and a proper combustion of the coal cannot take place, and CO is formed instead of CO_2. Under these conditions only about one-third of the calorific value of the coal is utilised, and two-thirds are therefore lost. The loss of fuel from this cause may be 5 to 15 % and even more. The time of the booked stops is too short, for it to be possible to remove the clinker through the fire-hole door with the shovel. The grate becomes clinkered up more quickly when the spaces between the bars are small; the increase of temperature arising from inadequate air openings leads to serious damage to the walls of the fireboxes fitted with brick-arches, as has been proved by the trials carried out at Stanislawow (Poland).

In order to improve the steaming, firemen try to introduce additional air by using the blower, but this practice leads to losses through incomplete combustion of the gases.

If an attempt is made to overcome the difficulty in another way by throwing out the clinker onto the track, wayside fires frequently occur, as in 1925 on the Lemberg division;

(1) Translated from the French.

b) During the total trip run by the locomotive from the time of leaving the shed until it returns, such a large amount of ash and clinker accumulates that their removal by means of a shovel through the firehole door may take more than half an hour besides being very trying work. Time is lost in getting the engines into the shed, and the engine workings are disorganised by reason of the long time taken in removing the ashes, not to mention the additional consumption of coal. Under these conditions the time available for the footplate staff for rest is lost or else they have to be relieved;

c) The sudden cooling of the firebox gives rise to contraction which affects the tubes and joints of the firebox, and often causes leaky tubes resulting in considerable expense and loss of time in repairs.

To overcome these disadvantages, the clinker and ashes may be removed by special devices, which may be divided into two groups :

1) Shaking grates in which the whole of the bed of fire is from time to time given a slight movement which gets rid of the clinker, etc. However, with this method only the smaller pieces which can pass through the spaces between the bars can be got rid of, and this arrangement, which is somewhat costly, can only be used where the clinker is in small pieces;

2) Certain sections of the grate are arranged to tilt, thereby providing, when required, openings through which the ashes and clinker can be pushed into the ashpan. This arrangement is suitable to all classes of coal and is widely used, especially in Europe. The tilting grates in use can be divided into two categories :

Those systems in which the tilting sections can be opened or closed mechanically; they are easily operated, but on the other hand require to be kept in good repair, or they are not sufficiently reliable. The most recent system is not mechanically operated, the tilting sections can be opened or closed by the fireman by means of the « pricker ». This arrangement, which is known as the « Titan tilting grate », has considerable practical advantages, since it can be fitted to all classes of locomotives without any modification, and can be quickly installed.

Consequently, the cost of fitting is very small; its first cost and maintenance costs are very low and it can be fitted to any firebox. Finally, it has the advantage that only a portion of the grate is tiltable, and the grate is not subjected to excessive expansion. This system has been fitted to the most powerful new engines of the Polish Railways (Class Os 24).

In the three reports presented to the London Congress on the reduction of the cost of traction, no full discussion took place on the removal of ashes and clinker, although this is of very great importance as regards the economy of fuel.

Report No. 1, by Mr. Emerson (1), contains a classification of grates proposed in 1915-1916 by the International Fuel Association (finger grates, shaking grates, fixed grates with tilting sections, etc.). It mentions a tendency to abandon finger grates (see pages 1043-1044) and the advantages of shaking grates (see pages 1044-1045), but expresses the hope that the question of grates will be discussed in detail by the Congress, which was not done.

Report No. 2, by Mr. C. B. Collett (2),

(1) See *Bulletin Railway Congress*, of the November 1924 number.

(2) See *Ibid.*, March 1925.

appreciates the importance of the reduction of time taken to remove clinker by means of the tilting grate; it estimates the saving is from 20 to 60 % of the time formerly necessary (see page 805), but he does not arrive at any definite conclusions.

Report No. 3, by Mr. H. Chenu (1), draws attention to shaking grates, and mentions the circumstances under which the application of such devices is advisable (see page 1931). The favourable results obtained with tilting grates mentioned in this report arise from results of trials carried out on the Paris-Lyons-Mediterranean Railway.

In order to demonstrate to the Congress the necessity of dealing thoroughly with this extremely important question, during the meeting of the 2nd section held on the 23 June, I asked those present to state the experience which they had had with various systems of removing ashes and clinker.

As a result of this request, Mr. Collins, delegate of the South African Railways, stated that the engines employed on those railways used for the most part coal of inferior quality, and as a general rule they used tilting grates for removing the ashes and clinker; the behaviour of these grates has, moreover, given complete satisfaction.

The delegate of the Ceylon State Railways, Mr. Head, stated in his country some of the locomotives are equipped with tilting grates and some with shaking grates, and that experience has proved the superiority of the tilting grate. (See page 6 of the *Daily Journal*, No. 2 of the 24 June 1925).

The Chief Mechanical Engineer of the Paris-Lyons-Mediterranean Railway Company, Mr. Vallantin, in reply to my question, made the following statement : « The Paris-Lyons-Mediterranean Railway has applied the *Titan* tilting grate to the locomotives received from Germany and Austria which were not previously fitted with any arrangement for the removal of clinker and ashes. This device has given very good results over a number of years. » He added that for recently built engines, although they might use a tilting grate mechanically operated, the only practical method for existing engines is to apply a tilting grate without any device for operating it mechanically, since this would require no alteration of existing fittings. The tilting grate may be fitted in place of a certain number of firebars and put into service without delay.

The truth of the foregoing remarks is verified by my personal observations on the Polish State Railways.

The last series Os 24 of locomotives on the Polish State Railways, a new and very powerful class of 4-8-0 passenger locomotives, built in 1925 at Chrzanow (Poland) and put in service in 1926 is fitted with the *Titan* tilting grate without any means of mechanically operating it.

We have also equipped several other classes of modern engines with the tilting grate non-mechanically operated. These have given satisfaction, especially as regards the saving in time necessary for dropping the fire. A number of existing engines have been fitted with these grates and allotted to different running sheds, where they have been kept under observation. The results have proved that all the inconveniences, which have arisen through the lack of a convenient method of removing ashes and clinker, as mentioned above, have been overcome.

There is no doubt that only a non-

(1) See *Bulletin Railway Congress*, of the May 1925 (2nd part).

mechanically operated tilting grate is to be recommended for existing locomotives, because it is the only device for removing clinker and ashes which can be adapted to locomotives without any serious modification, by merely taking out a number of the firebars and replacing these by a tilting grate, so that all the engines at a shed may be dealt with without any great cost and without loss of time. However, we await with interest the reports on various methods of removing ashes and clinker on recently built locomotives, which will probably be dealt with at the coming Congress at Madrid.

From my experience, a proper instruction of the footplate staff is of greater importance than the choice of the system. It goes without saying that strict supervision should be exercised, even when the men are fully acquainted with instructions for working the apparatus. The best system and the most perfect arrangement will not give satisfactory results if the men do not use it or use it wrongly.

As the result of my letter written from London to the Permanent Commission of the Congress, the general principles and the particular arrangements of various systems for removing ashes and clinker will, I think, be discussed in detail at the coming Congress. It is desirable that on this occasion the instruction of the footplate staff and the methods of working to be adopted, which are very important factors, should also be discussed.

[621. 138.5 (.73)]

Repairing locomotives at Pennsylvania Railroad Juniata shop,

Figs. 1 to 21, pp. 1085 to 1108.

(From *Railway Mechanical Engineer.*)

Scheduling system, material delivery, inspection methods, and standardized repair parts, outstanding features.

The Pennsylvania Railroad operates 7 103 locomotives, among which are 598 class I1s Decapod type, 574 class L1s Mikado type, 60 class N1s and 130 class N2s Santa Fe type, and 325 class K4s heavy Pacific type locomotives. These locomotives are heavy modern power which require, for economical maintenance, modern shop facilities and machine tool equipment. Many of the smaller shops in which these locomotives were repaired were not properly equipped to handle them to say nothing of the fact that the full capacity of these shops was needed to handle other classes of power. As a result of these conditions, it was decided to build a locomotive repair shop embodying features of design and equipment, especially adapted to handle the types of locomotives above enumerated.

The new facilities, shown in heavy lines in the plant layout drawing, which consist of an erecting and machine shop building, a flue shop, a carpenter shop, a storehouse, two welfare buildings, a power house, a 110-foot turntable and two outside overhead crane runways, are additions to the previously existing facilities of the Juniata shops, located east of the city limits of Altoona, Pa. The erecting and machine shop, which is of the transverse type is 691 feet long and 346 feet wide and is divided into four 85-foot bays, of which the outer two are for the erecting pits and tracks and the inner two for the machine shop. It will be seen from the plant layout drawing that this building lies almost at an angle of 45° with the cardinal points of the compass. For the sake of simplicity and clearness in referring to various locations in the shop, the ends of the building will be referred to as north and south and the sides as east and west, the east side being that towards the turntable.

Each erecting bay has 25 pit tracks with 25-foot centers and two entrance and exit tracks, making 27 tracks for each bay or a total of 54 tracks in the shop. Each erecting bay has two crane runways upon the upper of which is a 250-ton crane with two 125-ton trolleys. This is used for lift over service for the full length of the shop. The lower runway in each bay carries five 15-ton traveling cranes. Each erecting pit is supplied with outlets for air, electric lights, steam and water for washing and testing, etc. The steam pressure is 300 lb. and the water pressure 400 lb. for boiler testing. There are also connections to the sewer for boiler blow off.

Each machine bay is served by one 50-ton, double trolley crane and two 15-ton single trolley cranes. These bays are well supplied with electrically-operated pillar and jib cranes, there being

l. — General view of the Pennsylvania Juniata locomotive repair shop, showing the two welfare buildings, one at each end of the east side of the shop.

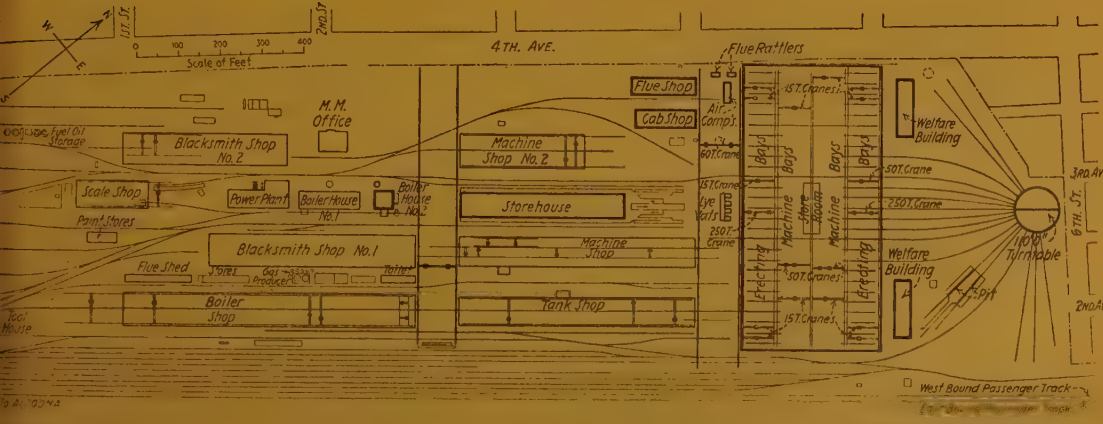


Fig. 2. — General plan of the Juniata shops. The new facilities are shown in heavy lines.

a total of 35 of these units ranging in capacity from 1 000 lb. to 2 000 lb. They serve the machines on which the heavier work is performed, such as machines for driving boxes, main and side rods, etc.

All the machine tools shown in the accompanying list are motor driven and push-button controlled. The wire conduit is laid in the floor. Practically all of the electrical control apparatus, such as starting rheostats, circuit breakers, etc., is mounted on the center row of

the building columns where they are less liable to injury and do not take up valuable floor space.

The offices of the general foreman, foreman, clerks, etc., are in the second floor of an enclosure 400 feet by 125 feet, located in the center of the two machine bays. The first floor of this building is taken up by a circulating tool room and storehouse. All small hand or portable tools are stored, serviced, and checked out in this tool room, and small supplies, such as bolts, nuts, etc., for immediate use are kept in the storehouse.

Method of lighting the shops.

The column to column sections of the machine shop bays are each lighted by three 500-watt lamps with suitable reflectors. These lights are located above the cranes and suspended from the roof by disconnecting hangers, which permit the lamps to be electrically disconnected and lowered to the crane platform for the purpose of cleaning without danger of electric shocks to the cleaners. The lamps in each bay section are controlled by a switch located on one of the center columns, enabling each gang to control its individual lighting requirements. In addition, each machine tool is equipped with an individual light for close work such as setting up, measuring, etc.

The two erecting bays are lighted by overhead lamps similar to those in the machine bays. In addition, each side of each track is lighted by two 500-watt lamps located in wide angle reflectors, one of which is located on the side column between the upper and lower crane runways and one below the lower crane runway. The two lamps on each of the columns are controlled by a switch on the same column.

The lighting of this shop is satisfactory. Owing to the location on the side columns of the lamps in wide angle reflectors, the light from the upper lamps is cast over the adjacent locomotive and onto the side of the next locomotive. As a result, the side of each locomotive, especially below the running board, is well lighted. The general lighting in the building is ample at any location to read fine print, blue prints, or make up reports.

The space occupied by the outside crane runway along the west side of the shop adjacent to erecting shop No. 1, which is taken up for the storage of heavy locomotive repair parts, for flue rattlers, cleaning vats and other purposes common to erecting shop operations, is lighted by 300-watt flood lights supported on the west wall of the building and similar flood lights on the west crane columns. As a night trick is employed at these shops, it was necessary to provide good lighting so that any class of material could be selected or work performed during this trick.

Construction of new supporting shops.

A new flue shop of brick and frame construction, measuring 162 feet by 45 feet adjoins the outside craneway near the north end of the main building. The flues are cleaned in two flue rattlers located under the outside crane runway and adjacent to the flue shop. A carpenter shop 151 by 45 feet is located south of the flue shop. This building is used for repairs to the locomotive cabs and, in addition, for any woodwork which may be necessary on the locomotive and tender, or in the operation of the Juniata shops.

The new storehouse is a three story and basement structure 400 feet long and 64 feet wide. It is built of reinforced concrete with brick facing. The basement and first floor are used for material storage while the second floor houses the mechanical and electrical engineering departments and the third floor the general offices of the works manager and his staff.

Two welfare buildings were erected

for the shop employees on the ground immediately adjoining the east side of the main shop building. These buildings are two-story structures, each 142 feet by 41 feet, of structural steel and brick construction. The first floor in each building is equipped with modern steel locker facilities, lavatories and toilets; the second floor has been provided with tables and benches and is used by the men as a rest and lunch room.

The main erecting shop is served by a 110-foot turntable, located at the extreme east end of the layout. This turntable serves nine lead-in tracks to the east erecting bay, known as erecting shop No. 2 and several storage tracks. Two of these tracks are extended through to the west bay which is also reached by other tracks coming in from the west side of the building. The turntable also serves two outside pits located near the erecting shop where finishing touches may be given to repaired locomotives.

Inspecting and stripping locomotives.

The four types of locomotives generally repaired in this shop are drawn from the Eastern and Central regions of the Pennsylvania System in about equal numbers. As the locomotives are brought in from outlying points, they are stored in the shop yard located south of the boiler shop and tank shop buildings. Five engines, or one day's shop output, are shifted each night to the inspection tracks located south of the tank shop. Here the engines and tenders are separated and prepared for the shop and are given a preliminary inspection by one boiler and two machinery inspectors. No underneath inspection is made at this time. These inspectors make out the preliminary machinery and boiler inspection reports shown in the accompanying illustrations. The locomotives are then placed on the various storage tracks served by the turntable. About three days' supply of locomotives are generally kept on these tracks to eliminate any possibility of having a repair track waiting for a locomotive and to allow the scheduling department ample time to analyze the inspectors' reports and order any material required for unusual repair jobs.

Erecting tracks Nos. 35 and 37 in erecting shop No. 1 and tracks Nos. 18 and 20 in erecting shop No. 2 are used for stripping the locomotives, which work is done on a three-trick basis. Locomotives receiving Class 1 and 2 repairs (new fireboxes or heavier boiler work) are completely dismantled by the stripping gangs. The boilers are loaded on cars and sent to the boiler shop and the frames to the frame gang located in the west machine bay, adjoining stripping tracks Nos. 35 and 37. Those parts which require cleaning are sent to the cleaning vats and after cleaning are sorted and hauled by electric trucks to the proper repair gangs in the machine bays.

All machinery, including brake rigging, all pedestal binder nuts, except one at each end of each binder, the cab, the superheater units and the front end equipment are stripped from the locomotives receiving Class 3, 4 and 5 repairs. The stripping gang also removes from these locomotives 10 test flues and 10 test cylinder bolts. The conditions indicated by these test parts help to determine the amount of repair work necessary. When removal of the flues is necessary, this work is done on the repair track, after which the flues are taken to the flue rattler and cleaned, and then to the flue shop for safe ending and testing, which is supervised by a gang foreman who reports to the erecting shop boiler foreman.

The lagging, spring rigging and flues are not removed as this work is done on the repair track, depending on the nature of the repairs required. After the locomotives to receive Class 3, 4

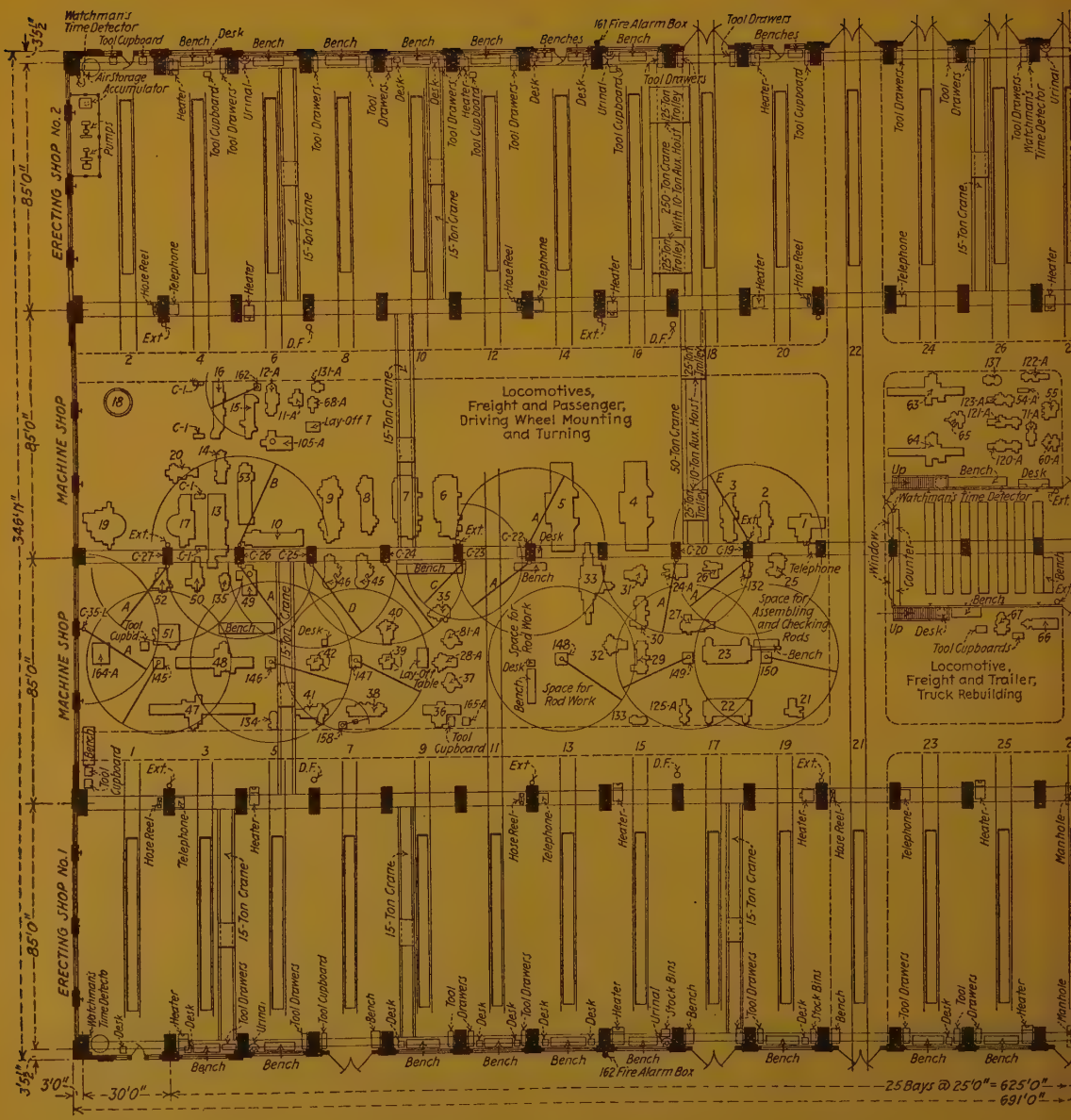


Fig. 3. — The north end of the main shop showing the machine tools and shop equipment used for repairing driving boxes, wheels, rods and bolts and nuts.

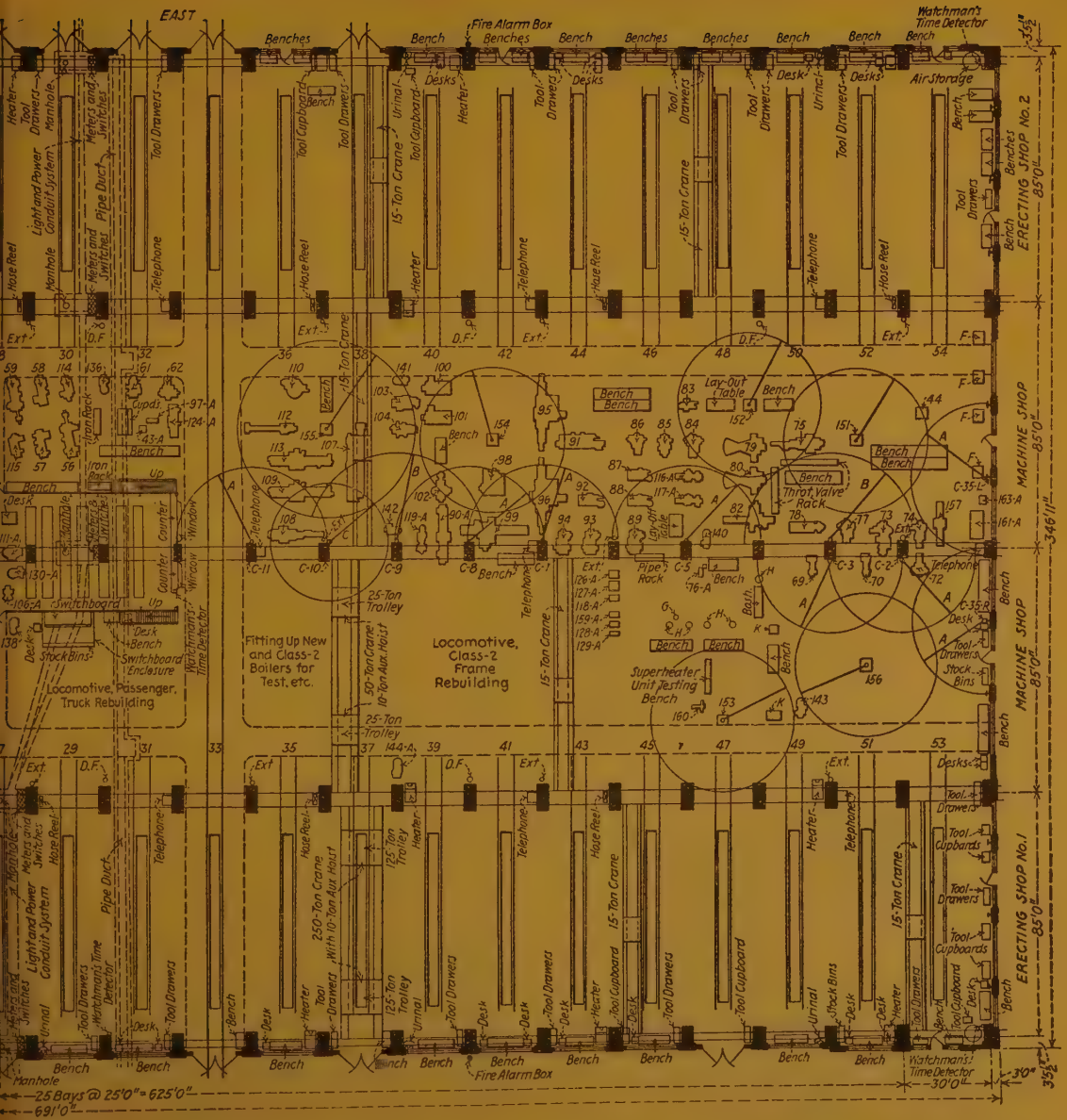


Fig. 4. — The south end of the main shop showing the location of the machine tools used for repairing valves and link motion, pistons and crossheads, ashpans, pipe work and miscellaneous work.

Machine tools installed at the Pennsylvania Juniata locomotive repair shop classified according to the repair gang in which they are located.

Driving box gang.

Drawing reference.	Number.	Description of machines.
38....	1	30-in. by 11-ft. 6-in. engine lathe.
41....	1	18-in. slotter.
134....	1	Tool grinder.
47....	1	48-in. by 48-in. by 16-ft. planer.
164-A.	1	44-in. by 60-in. driving box babbitting furnace.
51....	1	42-in. vertical turret lathe.
52....	1	Drill press.
50....	1	18-in. slotter.
135....	1	Tool grinder.
49....	1	5-ft. radial drill press.
45....	1	54-in. driving box boring mill.
46....	1	54-in. driving box boring mill.
40....	1	Drill press.
39....	1	100-ton press.
42....	1	100-ton press.
48....	1	48-in. by 48-in. by 12-ft. planer.
c-35-L.	1	1000-lb., 25-ft. radius column jib crane.
c-27....	1	1000-lb., 25-ft. radius column jib crane.
c-26....	1	1000-lb., 25-ft. radius column jib crane.
c-25....	1	1000-lb., 28-ft. radius column jib crane.
c-24....	1	1000-lb., 28-ft. radius column jib crane.
c-23....	1	1000-lb., 20-ft. radius column jib crane.
145....	1	1000-lb., 25-ft. radius pillar crane.
146....	1	1000-lb., 28-ft. radius pillar crane.
147 ...	1	1000-lb., 25-ft. radius pillar crane.
	2	Work benches.
	1	Layoff table.

Wheel repair gang.

18....	1	Tire heating furnace.
19....	1	100-in. tire mill.
20....	1	22-in. slotter.
17....	1	7-ft. boring mill.
16....	1	Heavy axle lathe.
13....	1	20-in. by 10-ft. plain grinder.
14....	1	23-in. by 10 ft. engine lathe.
15....	1	Axle keyseating machine.
53....	1	600-ton, 96-in. wheel press.
12-A.	1	23-in. by 10-ft. engine lathe.
11-A.	1	Milling machine.
131-A.	1	Tool grinder.
68-A.	1	16-in. shaper.
105-A.	1	5-ft. radial drill press.
4....	1	90-in. wheel lathe.
5....	1	90-in. wheel lathe.
6....	1	90-in. journal lathe.
7....	1	90-in. journal lathe.
8....	1	90-in. quartering lathe.
9....	1	100-in. quartering lathe.
10....	1	600-ton, 96-in. wheel press.
	1	Lay-off table.
c-27....	1	1000-lb., 25-ft radius column jib crane.
c-26....	4	1000-lb., 30 ft. radius column jib crane.
162....	1	4000-lb., 25-ft. radius air hoist.

Piston and cylinder bushings (part of wheel gang).

1....	1	Milling machine.
2....	1	23-in. by 12-ft. engine lathe.
3....	1	42-in. by 14-ft. engine lathe.
c-19....	1	1000-lb., 25-ft. radius column jib crane.

Main and side rod gang.

35....	1	24-in. shaper.
36....	1	Milling machine.
37....	1	36-in. vertical boring mill.
28-A.	1	Drill press.
81-A.	1	36-in. vertical boring mill.
165-A.	1	24-in. by 30-in. brazing furnace.
33....	1	22-in. by 84-in. surface grinder.
31....	1	Drill press.
30....	1	Turret lathe.
32....	1	Drill press.
29....	1	Turret lathe.
133....	1	Tool grinder.
24-A.	1	Plain grinder.
26....	1	75-ton press.
132....	1	Tool grinder.
25....	1	Cylindrical grinder.
27....	1	18-in. slotter.
23....	1	Rod boring machine.
125-A.	1	16-in. by 8-ft. engine lathe.
22....	1	Rod boring machine.
21....	1	75-ton press.
148....	1	1000-lb., 25-ft. radius pillar crane.
149....	1	1000-lb., 25-ft. radius pillar crane.
150....	1	1000-lb., 25-ft. radius pillar crane.
c-19....	1	1000-lb., 25-ft. radius column jib crane.
c-20....	1	1000-lb., 25-ft. radius column jib crane.
c-22....	1	1000-lb., 25-ft. radius column jib crane.
	3	Work benches.

A = These machines are bolted permanently to the floor but are not set on concrete foundations as are the others.

Brass and bolt gang.

Drawing reference.	Number.	Description of machines.
63....	1	36-in. by 36-in. by 12-ft. planer.
64....	1	36-in. by 36-in. by 12-ft. planer.
65....	1	Drill press.
120-A.	1	16-in. by 10-ft. engine lathe.
121-A.	1	16-in. by 10-ft. engine lathe.
123-A.	1	16-in. by 8-ft. engine lathe.
137....	1	Tool grinder.
122-A.	1	16-in. by 8-ft. engine lathe.
54-A.	1	Small bolt centering machine.
55....	1	Triple head bolt threader.
71-A.	1	Turret lathe.
60-A.	1	Bolt altering machine.
58....	1	Turret lathe.
59....	1	Turret lathe.
114....	1	Turret lathe.
115....	1	Turret lathe.
57....	1	Turret lathe.
56....	1	Turret lathe.
136....	1	Tool grinder.
	2	Work benches.
	2	Iron racks.

Small tools and machinery repair gang.

61....	1	24-in. shaper.
62....	1	Drill press.
97-A.	1	Small metal saw.
124-A.	1	24-in. by 10-ft. engine lathe.
43-A.	1	Small tool grinder.
	2	Work benches.

Engine truck and trailer gang.

67....	1	24-in. shaper.
66 ...	1	Radial drill press.
138....	1	Tool grinder.
	2	Work benches.

Piston and crosshead gang.

110....	1	36-in. by 44-in. boring mill.
112....	1	400-ton., 48-in. wheel press.
113....	1	36-in. by 20-ft. engine lathe.
109....	1	36-in. by 20-ft. engine lathe.
108....	1	Horizontal boring mill.
107....	1	20-in. by 144-in. plain gap grinder.
141....	1	Tool grinder.
100....	1	5-ft. radial drill press.
101....	1	5-ft. radial drill press.
103....	1	Vertical surface grinder.
104....	1	24-in. shaper.

Drawing reference.	Number.	Description of machines.
102....	1	15-in. slotter.
142...,	1	Tool grinder.
119-A.	1	16-in. by 8-ft. engine lathe.
90-A.	1	23-in. by 14-ft. engine lathe.
98....	1	42-in. vertical turret lathe.
99....	1	48-in. by 48-in. by 10-ft. planer.
95....	1	22-in. by 84-in. grinder.
96....	1	22-in. by 84-in. grinder.
155....	1	1000-lb., 30-ft. radius pillar crane.
154....	1	1000-lb., 25-ft. radius pillar crane.
c-11....	1	1000-lb., 25-ft. radius column jib crane.
c-10....	1	1000-lb., 20-ft. radius column jib crane.
c-9 ...	1	1000-lb., 30-ft. radius column jib crane.
c-8....	1	1000-lb., 25-ft. radius column jib crane.
	2	Work benches.

Valve and link motion gang.

91....	1	12-in. by 96-in. plain grinder.
92....	1	10-in. by 24-in. plain grinder.
93....	1	Cylindrical grinder.
94....	1	Cylindrical grinder.
86....	1	Drill press.
87....	1	10-in. by 24-in. plain grinder.
88....	1	10-in. by 24-in. plain grinder.
89....	1	Cylindrical grinder.
83....	1	75-ton press.
84....	1	Drill press.
85....	1	24-in. shaper.
116-A.	1	16-in. by 8-ft. engine lathe.
117-A.	1	16-in. by 8-ft. engine lathe.
140....	1	Tool grinder.
79....	1	Radius grinder.
80....	1	Radius grinder.
82....	1	36-in. by 36-in. by 8-ft. planer.
152....	1	1000-lb., 25-ft. radius pillar crane.
c-7..,.	1	100-lb., 28-ft. radius column jib crane.
c-5....	1	1000-lb., 25-ft. radius column jib crane.
	2	Work benches.
	2	Lay off tables.

Pipe gang.

126-A.	1	Pipe threader.
127-A.	1	Double head pipe threader.
118-A.	1	Pipe threader.
159-A.	1	Pipe threader.
128-A.	1	Pipe cutting machine.
129-A.	1	Pipe burr removing machine.
76-A.	1	Copper pipe saw.

Drawing reference.	Number.	Description of machines.
160....	1	Superheater unit testing valves and stand.
153....	1	1000-lb., 25-ft. radius pillar crane.
H....	5	24-in. diameter pipe bender furnaces.
K....	2	24-in. by 36-in. pipe bender's furnaces.
G....	1	22-in. diameter pipe bender's furnace.
	4	Work benches.
	1	Superheater unit testing bench.
	1	Pipe rack.
		Miscellaneous gang.
75 ...	1	Horizontal boring mill.
78....	1	Radial drill press.
77....	1	Drill press.
74....	1	Slotter.
73....	1	18-in. traveling head slotter.
157....	1	Stock adjusting machine.
161-A.	1	13½-in. by 44-in. pedestal cap. furnace.
163-A.	1	18-in. by 30-in. annealing furnace.
44....	1	Belt driven hammer.
151....	1	1000-lb., 25-ft. radius pillar crane.
c-3....	1	1000-lb., 30-ft. radius column jib crane.
c-35-2..	1	1000-lb., 25-ft. radius column jib crane.

Drawing reference.	Number.	Description of machines.
F....	4	42-in. by 42-in. blacksmith forges.
	4	Work benches.
	2	Throttle valve racks.
		Ash pan gang.
69....	1	36 in. shear.
70....	1	36-in. punch.
72....	1	Drill press.
143....	1	Tool grinder.
156....	1	1000-lb.. 30-ft. radius pillar crane.
c-3....	1	1000-lb., 36-ft. radius pillar crane.
c-2....	1	1000-lb., 25-ft. radius pillar crane.
c-35 R.	1	1000-lb., 25-ft. radius pillar crane.
	2	Work benches.
		Machine and tool room.
111-A.	1	Tool grinder.
130-A.	1	Tool grinder.
106-A.	1	Drill grinder.
	1	Work bench.
		Frame gang.
144-A.	1	Tool grinder.

and 5 repairs are stripped thus far, they are moved outside of the shop, if the designated repair track is not empty, where about six or eight of them are usually kept in storage. When needed they are placed on the entrance or exit track pits where they are unwheeled in about one hour, after which they are placed on the repair tracks ready for rebuilding.

The parts requiring cleaning are sent to the four 10-foot by 15-foot by 5-foot steel-lined concrete cleaning vats located outside of erecting shop No. 1. Four perforated steam pipes are located on the bottom of each vat for the purpose of heating and agitating the cleaner. Each vat requires an initial mixture of 1 300 lb. of flake caustic soda and 500 gallons of water, to which 325 lb. of soda is added weekly. The vats are cleaned out every three months.

The parts are here loaded in perforated steel boxes. All the lifting is done by crane type electric trucks except placing the steel boxes in vats which is done by the overhead crane. There are several sizes of boxes designed to fit and fill the vats in connection with each other, the medium size being designed to hold 10 driving boxes and 10 pedestal binders, all from a Decapod locomotive. The parts remain in the bath about 2 hours, after which they are removed, rinsed in warm water and then distributed for repairs.

Shop organization.

About 1 950 men are employed in this shop under the direct supervision of a general foreman. Each erecting bay consisting of 27 tracks (23 of which are used for erecting work) is supervised by an erecting foreman. Each daylight erecting foreman has under his juridiction five track gangs, two pipe gangs, two steam pipe gangs and one valve motion and brake rigging gang, each supervised by a gang foreman. The night foreman

Preliminary Inspection Report — Machinery

Loco. No..... Class..... Divn..... Class Reprs..... Date Rec'd.....

Pilot_____ Coupler_____
Bumper Castgs. R.____C.____L.____
Center Castgs. Under Cyl._____

CYLINDER AND SADDLE :

R. Is Cyl. Working_____
Are Bolts O. K._____
L. Is Cyl. Working_____
Are Bolts O. K._____
Guides R._____ L._____
Crosshead R._____ L._____
Guide Yoke R._____ L._____
Lift Shaft_____
Link Brkt. Suppt. R._____L._____
Link Bracket R._____L._____

EXPANSION SHEETS :

No. 1 Top R.—L.—Bottom R.—L.—
No. 2 Top R —L.—Bottom R.—L.—
No. 3 Top R.—L.—Bottom R.—L.—
No. 4 Top R.—L.—Bottom R.—L.—
No. 5 Top R.—L.—Bottom R.—L.—
No. 6 Top R.—L.—Bottom R.—L.—

FRAME STIFF CASTINGS :

No. 1 R._____L._____
No. 2 R._____L._____
No. 3 R._____L._____
No. 4 R._____L._____

SPRING EQUAL. SEAT ON FRAME :

No. 1 R._____L._____
No. 2 R._____L._____
No. 3 R._____L._____
No. 4 R._____L._____

LATERAL FRAME BRACE :

No. 1_____
No. 2_____
No. 3_____
Boiler Suppt. at Mud Bar R.____L.____
Foot Plate Casting_____
Cab Bracket R._____L._____
Smoke Box Frt. End Ring____Door____
Air Res. Brkts. on Frt. End_____
Running Boards R._____L._____
Stack_____ Well_____
Sand Box_____ Whistle_____
Safety Valves_____
Hand Rail over Smoke Box_____
Hand Rail on Boiler R._____L._____
Superht. Damper Cyl._____
Dome Cap & Studs_____

RUNNING BOARD BRACKETS :

R. No. 1_____ L. No. 1_____
R. No. 2_____ L. No. 2_____
R. No. 3_____ L. No. 3_____
L. No. 4_____ L. No. 4_____
Running Board Brkt. Studs R.____L.____
Air Res. Brkts. R._____ L._____
Air Res. Brkt. Studs R._____ L._____
Power Reverse Gear_____
Power Gear Bracket_____
Power Gear Brkt. Studs_____
Air Pump_____
Air Pump Bracket_____
Air Pump Brk. Studs_____
Feed Water Pump_____
Feed Water Pump Brkt._____
Feed Water Pump Brkt. Studs_____

VALVE GEAR :

Link Trunnion Bushgs, R._____L._____
Link R._____ L._____
Link Block R _____ L._____
Eccentric Crank R._____ L._____
Eccentric Rods R._____ L._____
Radius Rods R._____ L._____
Connecting Links R._____ L._____
Lamp & Lead Levers R._____ L _____
Valve Stem Xhds. R._____ L._____
Back Valve Chb. Hds. R._____ L._____
Front Valve Chb. Hds. R.____L._____
Piston Ext. Guide R._____ L._____
Piston Ext. Guide Cov. R.____L._____

JACKET :

Bands
Barrell_____
Fire Box Inside Cab_____
" Outside Cab_____
Fire Door Frame_____Fire Door_____
Cab_____
Glass Water Gauge_____
Steam & Air Gauges_____
Throttle Lever_____
Blower Rigging_____
Cocks & Valves_____
Inj. Opr. Rigging_____
Lubricator_____
Main Rods R._____ L._____
Side Rods R._____ L._____

FRAMES :

Main R._____L._____
Front R._____L._____
Rear R._____L._____

REMARKS :_____

DRIVING BOX LATERAL

R. 1_____L. 1_____
R. 2_____L. 2_____
R. 3_____L. 3_____
R. 4_____L. 4_____
R. 5_____L. 5_____

TIRE THICKNESS

R. 1_____L. 1_____
R. 2_____L. 2_____
R. 3_____L. 3_____
R. 4_____L. 4_____
R. 5_____L. 5_____

TIRE WEAR

R. 1—L. 1—
R. 2—L. 2—
R. 3—L. 3—
R. 4—L. 4—
R. 5—L. 5—

TIRES : Turn_____ Renew_____

DRIVING BOX JOURNAL FIT

R. 1_____ L. 1_____
R. 2_____ L. 2_____
R. 3_____ L. 3_____
R. 4_____ L. 4_____
R. 5_____ L. 5_____

ENGINE TRUCK LATERAL

R. 1_____L. 1_____
R. 2_____L. 2_____

TRAILER TRUCK LATERAL

R._____L._____

Broken or Missing Locomotive and Tender Parts

Date Inspected_____ Inspector_____

This detailed report is filled out by the machinery inspectors when they examine a locomotive received at shop for repairs.

who is the stripping foreman has charge of two track gangs, one pipe gang and one steam pipe gang in each erecting shop in addition to his stripping organization, which completes out-going locomotives and work on those receiving extra heavy repairs.

Each erecting bay has a daylight assistant boiler foreman who reports to the boiler shop foreman. Each of these two men has charge of a flue gang, two boiler repair gangs and two ash-pan gangs on the daylight force and one flue gang, two boiler repair gangs and two ash-pan gangs make all repairs to the boilers in organization and are handled by the stripping foreman. The boiler repair gangs make all repairs to the boilers in the shop, give boilers special staybolt examination, apply all patches, sheets and bolts necessary to remove and reset the flues. They also cut out and apply flues to all Class 1 and 2 repair locomoves. They also remove and replace cabs, running boards, front end arrangement, and ash-pans.

When a Class 1 or 2 repair boiler comes from the boiler shop, the boiler trimming gang in the machine bay applies all boiler fittings and finishes the boiler ready for testing. The usual procedure is to test and steam the boiler and apply the lagging and jacket before it is put on the frame.

The stripping foreman dismantles all the locomotives and his inspectors cover the locomotive machinery and pipe parts as dismantled and authorize all the repair work. The boiler is not given its final inspection until it is placed either on the erecting track or in the boiler shop.

Other foremen, reporting directly to the general foreman, are the tank shop foreman, the carpenter shop foreman, three machine shop foremen, a piece-work foreman and a schedule foreman.

There are piece-work inspectors reporting to a piece-work foreman who approves the finished work and authorizes the payment designed on the piece-work charts. The piece-work foreman handles all questions pertaining to piece-work prices, etc.

Of equal importance is the schedule foreman whose inspectors examine the locomotive when received at the shop and from whose reports the general repairs and schedule time is determined. From this basis the schedule times for the parts to be returned to the locomotive and operations to be completed are set as well as the date the locomotive is to go out of the shop. The schedule foreman also controls the cleaning and delivery of all materials from the cleaning vats and storehouse.

How the schedule department functions.

The schedule foreman has under him a boiler and two machinery inspectors whose duties are to inspect the locomotive when received at the shops. These inspectors make a record on a form of every part inspected. In addition, when the locomotives are being stripped and after the locomotives are placed on the repair tracks, the stripping foreman and track gang foreman make an inspection and report to the schedule foreman any unusual conditions or exceptionally heavy work which was not included on the original inspector's report. After this information is assembled the scheduling department determines the time required to repair each part and the time at which each locomotive is to leave the shop. This information is filled in on the blank form shown in one of the illustrations, and the information given to each repair gang foreman by placing it on his schedule board. It is also entered on a master schedule board located in the schedule foreman's office. The list of parts on this board is arranged in the same way as that on the foreman's forms, with enough vertical

Machine Shop Repair Items.						Erecting & Boiler Shop Repair Operations.			
Description.	From E. S.		To E. S.		*Remarks.*	Operation.	Due.	Comp.	*Remarks.*
	Due.	Del.	Due.	Del.					
Crossheads						Stripped & Work Dist.			
Pistons						Loco. placed on Rep. Trk.			
Guides						Flues out			
Driv. Boxes						Flues in			
Wheels, Cranks						Flue Work completed			
Main Rods						Boiler washed			
Side Rods						Boiler work comp.			
Trailer Truck						Frames & Cyl. work comp.			
Engine Truck						Caps & Spring Rigging up			
Piston Packing						Lift Shaft erected			
Cocks & Valves						Shoes & Wedges layed out			
Power Reverse						Loco. Wheeled & Trammed			
Screw Reverse						Guide Pist. & X-Hd. erec.			
Reverse Lever						Rods erected			
Feed Water Pump						Stokers on			
Stoker						Valve & Link Motion erec.			
Throttle Rigging						Valves set			
Spring "						Boiler closed & tested			
Brake "						Units in & tested			
Link Motion						Ash Pans up, Grates in			
Eccen. Rods						Cab on			
Piston Valves						Lagging & Jacket on			
Chamber Heads						Pipe work completed			
Throttle Lever						Remarks			
Reach Rods									
Lift Shaft						Loco. No. Class Repairs In Shop			
Link Brackets						Scheduled out Completed Bay No. Trk. No.			

This form is filled out by the schedule foreman and the information is posted on the shop schedule boards for each supervisor in the shop.

columns to take care of one month's output.

As the locomotives are rebuilt, the schedule foreman closely follows the time schedules and sees that the parts are delivered to the repair tracks in time. He considers time only and does not pass on the quality of workmanship, this being the function of the gang foreman and piece-work inspectors. As each part is repaired and placed on the locomotive, the gang foreman first examines the work, after which the piece-work inspector finally passes it. If it meets with his approval he O.K.'s the piece-work charges and authorizes payment to the men for the work which they have performed.

Another function of the scheduling department is to order all material and have it delivered to the repair tracks, the machine bay repair gangs or the working and stock bins. Twenty telephone booths, located in the erecting and machine bays are connected with a switchboard located in the schedule foreman's office. As each gang foreman needs material he calls up the office, tells what material he wants, how it is to be charged and where it is to be delivered. This information is put on a material order slip which is taken at 20-minutes intervals by a messenger to a labor leader located at the main storehouse. There are three labor gangs under the schedule foreman, each handling a certain line of material. The orders are then filled and delivered by electric trucks to the designated points. All repaired parts are delivered to the pit tracks by the repair sections. The purpose of this system is to keep the repairmen busy and not waste time going after new or repaired parts.

Material bins are conveniently located about the shop. In these are kept about 2 500 different small parts. The schedule foreman assigns a labor gang with electric trucks to keep these bins filled. This gang devotes all of its time to watching the bins, drawing the material from the main storehouse and properly piling it in the bins. Each month's material charges are distributed over the number of locomotives turned out during the month.

The reclamation of scrap also comes under the supervision of the schedule foreman. All the scrap material is hauled out to the scrap platform located at the east end of the storehouse. Here it is inspected by one man who passes on every piece and picks out what he thinks can be reclaimed and the remainder is thrown into the scrap car. He also routes it to the proper shop for any reclamation work necessary.

Organization of the machine bays.

The two machine bays are supervised by three foremen. Starting at the north end of the machine bays, the first foreman has charge of wheel, box, rod and truck repairs. The foreman in the middle of the machine bays has charge of the repairs to pistons, crossheads and guides, valve and link motion work, brass and bolt work, brake and spring rigging and miscellaneous work. The third foreman at the south end of the shop has charge of Class 1 and 2 boiler repairs, repairing frames, superheater units, pipes, ash-pans, welding and cutting work and the toolroom and machinery repair work.

Standardizing repair parts.

The Pennsylvania Railroad for many years has been working towards the standardization of repair parts for locomotives. As a result, practically all new parts, such as crank and knuckle pins and bushings, valve motion parts, piston valves and bushings, shoes and wedges and similar parts are semi-finished in other departments. This practice reduces the work in the two machine bays to a minimum. As an illustration, all

Fig. 5. — These four cleaning vats located along the west side of the shop are served by electric crane trucks.

Fig. 6. — This 110-foot turntable serves nine lead-in tracks to the repair shop.

Fig. 7. — General view of the east machine bay showing a part of the wheel gang.

Fig. 8. — One of the large wheel lathes. — Note that the driving boxes are on the pair of wheels in the lathe.

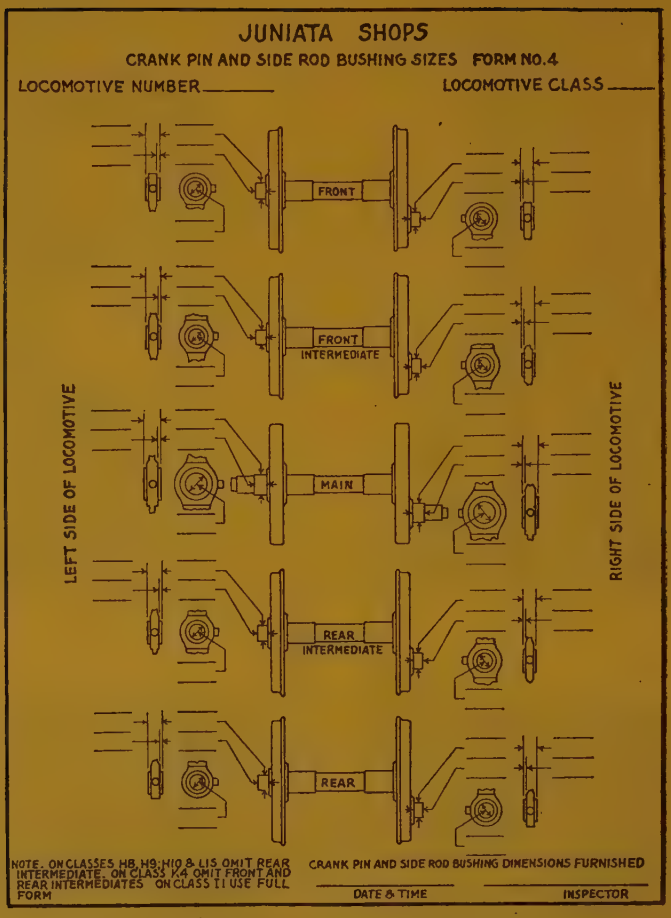

JUNIATA SHOPS
CRANK PIN AND SIDE ROD BUSHING SIZES FORM NO.4
LOCOMOTIVE NUMBER
LOCOMOTIVE CLASS
FRONT
FRONT INTERMEDIATE
MAIN
REAR INTERMEDIATE
REAR
LEFT SIDE OF LOCOMOTIVE
RIGHT SIDE OF LOCOMOTIVE
NOTE. ON CLASSES H8, H9, H10 & L1S OMIT REAR INTERMEDIATE. ON CLASS Y4 OMIT FRONT AND REAR INTERMEDIATES ON CLASS T1 USE FULL FORM
CRANK PIN AND SIDE ROD BUSHING DIMENSIONS FURNISHED
DATE & TIME
INSPECTOR

Fig. 9. — This form is filled out by the driving box, rod and wheel inspector.

valve motion pins and bushings are blanked out to establish step sizes on automatic screw machines and then case-hardened in the automatic shop which is a unit of the Altoona machine shops. The bore of the bushings and the body or bearing surface of the pins are ground to gage sizes by quantity production methods. Therefore, it is only necessary when fitting these parts to the locomotives, to grind the outside of the bushing and the two tapered ends of the pins. Suitable gages and micrometers are provided which reduce the time of fitting to a minimum. Practically the same methods are followed for side rod knuckle pins and bushings, crank pins, etc. The result of supplying these semi-finished parts to the new shops is reflected in the number of machine tools installed in the new machine shop bays which is smaller per locomotive repair-

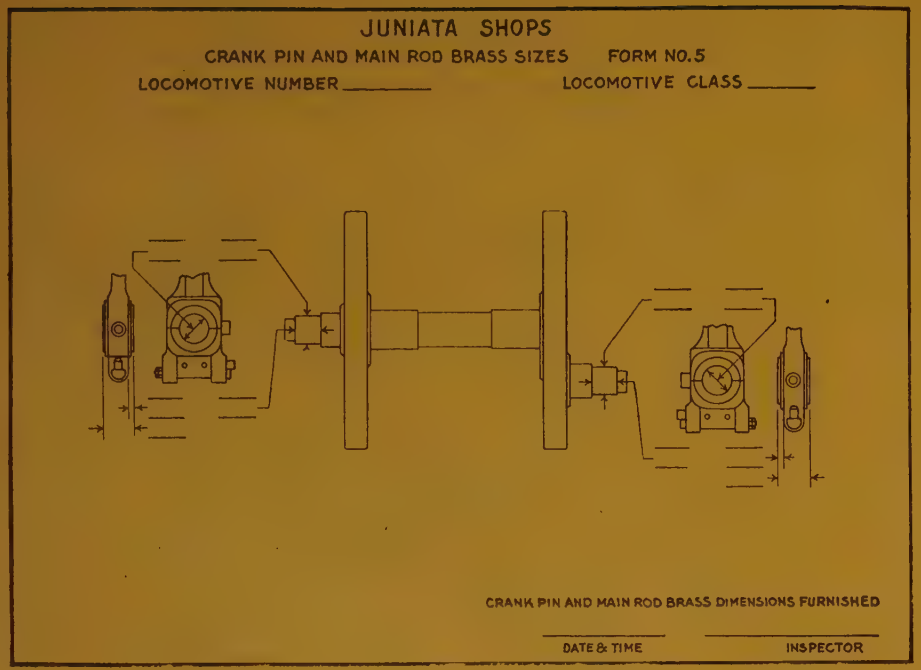


Fig. 10. — The machine operators determine the final crank pin and main rod brass sizes from this form.

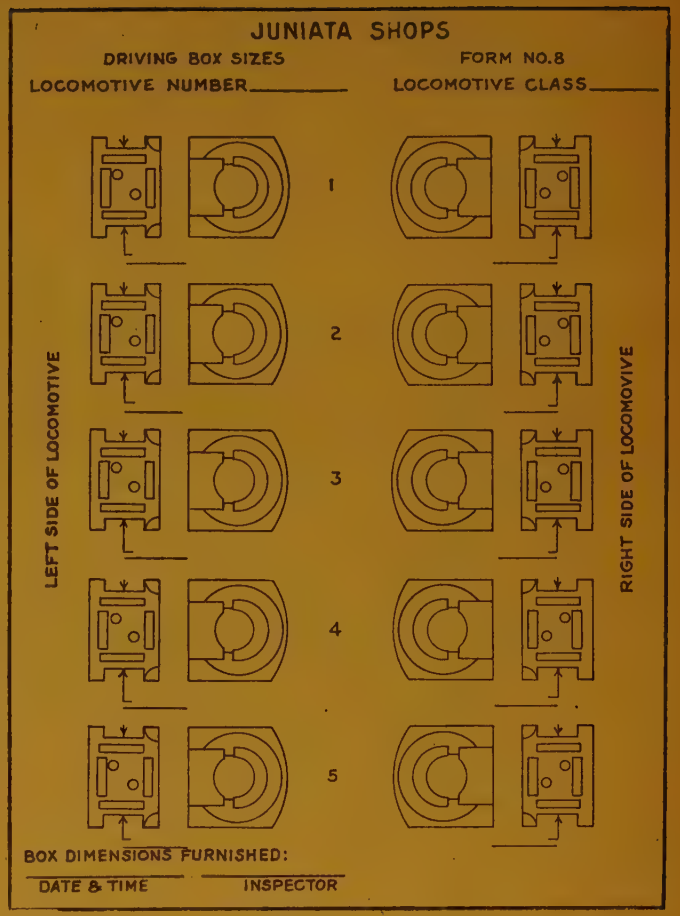


Fig. 11. — This form is filled in and given to the planer operator in the driving box gang.

ed than in the general average of locomotive repair shops.

As one passes through the machine bays there is a noticeable absence of filing operations. This is made possible by the liberal use of plain, cylindrical, internal and surface grinders, milling and other machines, some of which have been fitted up for one particular operation. The experience at Altoona has shown the economy of assigning a machine to a single specified job and fitting that machine with all possible labor saving devices wherever a sufficient volume of work is available.

One also soon becomes aware of the fact that the machine operators rarely leave their machines to take measurements, a condition that has been brought about by the liberal use of micrometer calipers and size blanks. The use of accurate measuring devices has made it practicable for the inspectors to measure and set down on specially prepared blanks (1) the dimensions to which the new or repaired parts are to be finished, allowance being made by the inspectors for the fit.

Another outstanding feature of the work in the machine shop is the extent to which special gages, fixtures, jigs, etc., are used to speed up the work.

Utilization of semi-finished parts and micrometers, dimension forms. Other machine shop methods.

In order properly to understand many of the machine operations in the two machine bays and the plan followed by the inspectors when deciding on the repairs required and the system of marking on the special dimension blanks the sizes to which the new parts should be machined, a general knowledge of the Pennsylvania Locomotive Maintenance Instructions is necessary.

These instructions have been issued for the guidance of the shops when manufacturing parts for new or repaired locomotives, when fitting new parts to the old parts, and in determining allowable limits of wear before repairs or replacements are considered necessary. Practically all the measurements mentioned on these instructions are in thousandths of an inch, which makes it comparatively easy to take all measurements with micrometer calipers and record them readily on dimension blanks. Owing to the fact that the limits of wear on the various wearing surfaces, as well as the tolerances permitted on the part of the workmen when fitting new parts, are specified by the maintenance instructions, the effect of variations in individual judgment of the inspectors or workmen is eliminated.

This may be illustrated by the case of a journal of a driving axle. The Locomotive Maintenance Instructions specify that when the journal of a driving axle is less than 0.032 inch out-of-round, has less than 0.032 inch taper and is not cut or in otherwise poor condition, it will be satisfactory to put the journal back into service without making repairs. When the out-of-round, or the taper exceeds these limits, the journal must be turned and refinished. The instructions also specify that after returning, the limit of out-of-round or taper shall not exceed 0.005 inch.

When the axle is ready for inspection, the inspector measures the journal with micrometer calipers, first ascertaining the largest then the smallest diameters; the difference between the two readings

(1) There are nine of these dimension blanks, four of which are used to illustrate the article. The other five show cylinder and valve chamber sizes, pedestal cap sizes, piston rod and crosshead pin sizes, guide and crosshead sizes, and a report on side rod brasses.

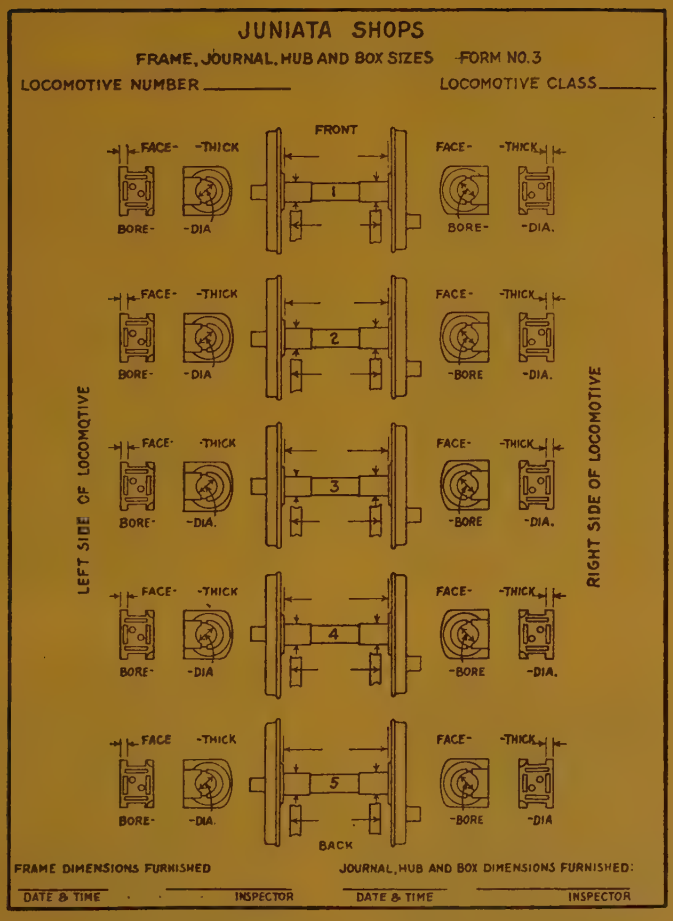


Fig. 12. — The dimensions set down in this form are used by the driving box gang.

determining whether or not the journal will go back into service without repairs, or whether it shall be sent to the journal lathe for re-turning. Assuming that the journal comes within the limits and is smooth, under which condition no turning is required, the size of the largest diameter is then marked on the dimension chart blank for frame, journal hub and box sizes shown in the illustration. In the event of not meeting the maintenance requirements, the journal is marked for re-turning, after which it is again inspected and if the dimensions are according to requirements, the largest size is measured and marked on the dimension blank.

From the data given on these dimension blanks, the diameter to which the driving box brass is to be bored is determined; that is, the bore of the driving box brass should be 0.020 inch larger

JUNIATA SHOPS

Preliminary Inspection Report — Boiler Work

Loco. No.....Class.....Divn.....Class Reprs.....Date Rec'd.....

GRATES:
- Drop
- Shaking
- Dead
- Grate Operating Rigging

ASH PAN:
- Wing Sheets R.——L.——
- Front Head
- Back Head
- Front Hopper
- Back Hopper
- Operating Rigging

FLUES:
- Superhtr. Renew—— Chip & Weld ——
- Small " " " ——
- Flue Sheet, Front
- Flue Sheet, Rear
- Flue Sheet, Caulking Edge
- Fire Box Side Sheet R.——L.——
- Door Sheet
- Crown Sheet in Fire Box
- Crown Sheet in Boiler
- Outside Sheets Below Jackt, R.——L.——

ARCH TUBES:
- No. 1 Front——No. 1 Back——
- No. 2 Front——No. 2 Back——
- No. 3 Front——No 3 Back——
- No. 4 Front——No. 4 Back——

BOILER TEE IRONS:
- No. 1
- No. 2
- No. 3
- No. 4

- Lift Pipe
- Front End Arrgt.
- Boiler Built

BOILER WORK DUE:

Removal of Flues
- Yes.....Date Due for
- No.....Removal.....

S. B. Examination
- Yes.....Date Due for
- No.....Examination

All Jackt. & Lag. Removed
- Yes.....Date Due for
- No.....Removal.....

Removal Staybolt Caps
- Yes.....Date Due for
- No.....Removal

Hydrostatic Test
- Yes.....Date Due for
- No.....Test

Application Hollow Staybolts

Back of Grate Bearers
- Yes.....Date Due for
- No.....Appl.....

Boiler Equip, with the two outside rows Expan. Stays in Crown Sheet
- Yes.....
- No.....

- Front Flue Sheet Braces
- Back Head Braces
- Back Head Sheet
- Throat Sheet

Remarks:

Date Inspected——— Inspector———

When the boiler inspector makes an examination of a locomotive coming into the shop he fills out this report.

than the journal. However, a limit of 0.005 inch, plus or minus, is allowed the workman when boring the brass. Therefore, he must bore between 0.015 and 0.025 inch larger than the journal to meet the requirements.

Fig. 13. — The machines in the foreground are used in the brass and bolt gang. To the left is a general view of erecting shop No. 2.

Fig. 14. — General view of the west machine bay showing the machines for repairing driving boxes in the foreground. Note the platforms loaded with material brought from the cleaning vats by electric trucks.

Fig. 15. — Engine and trailer trucks are repaired along the west side of the office building.

Fig. 16. — A section of the valve and link motion repair gang.

While the driving axle has been cited as a specific case, similar instructions covering practically all of the important locomotive parts are available. These instructions are posted about the shops and are frequently referred to by the inspectors and the workmen. In the event of disputes, the micrometer measurements and the instructions will show who is at fault.

Repairing parts in the machine bay.

The practice of standardizing the repairs of locomotive parts makes it possible for many of the parts to lose their identity when removed by the stripping gang. Thus, the driving boxes, main and side rods if the brasses must be renewed, pistons, crossheads, valve and link motion parts, foundation brake and spring rigging, ash pans and engine and trailer trucks seldom are put back on the same locomotives from which they were removed. These parts are repaired and brought back to standard dimensions, except where variable conditions are met due to fits to other parts, after which they are considered as stock material. Say, for instance, a set of Ils driving box sizes are needed for the erecting shop to lay out shoes. These stock boxes have been repaired and await only the journal and hub sizes for final boring and facing of the brasses and hub liners. Ten boxes are selected, the engine number and location are stencilled on them and the sizes furnished the erecting shop on a form. After the journal and hub sizes are determined the boxes can then be bored and faced to fit. This practice speeds up the repair operations and permits a considerable part of the machine shop repair work to be done on a small scale production basis. Parts like brake rigging lose their identity, are made standard and sent to the locomotive in complete sets.

After removing the main rods, they are cleaned and forwarded to the rod gang, placed on trestles, the brasses removed and the rods examined for possible defects. The openings in the front and rear jaws are measured with micrometers. If a jaw opening varies from parallel more than the maximum allowed, the rod is sent to a slotter for truing. Also if the side faces of the jaws are worn out of parallel, they are ground on a vertical surface grinder while held on a magnetic chuck. As a rule, the blocks, wedges and, at times, the front end brasses are placed in the rods at the time of grinding in order to finish these parts flush with the sides of the rods. This practice eliminates much of the work of fitting the wedges and brasses and also gives the sides of the rods a finished bearing surface.

After the ends are found to be within the limits specified by the maintenance instructions, the width of the jaw opening and also the thickness of the rod at the rear end are measured with micrometers and the sizes marked on a blank from which the front and rear brasses are milled to the required rod fits.

Machining rear main rod brasses

The scale on the phosphor bronze rod brass castings rapidly wears the cutting tools and this is expensive in the case of milling cutters. The back end main rod brasses are, therefore, rough machined on planers, 16 pairs at one setup. This work is done in one of the production machine shops at Juniata or the Altoona machine shops. The two abutting surfaces are smoothly finished and the surfaces that bear on the rod are rough planed to allow about 3/16 inch on all surfaces for the final fitting in the rod. These semi-finished brasses are then placed in stock.

When a new pair of rod brasses is to be placed in a rod, the final finishing is done in the west machine shop bay of the new shop on a knee type plain milling machine. The semi-finished

brasses are held in an eight-point indexing fixture. The two halves of the brass are butted together and clamped by a handle at the top of the fixture. The width between the flanges on one side of the brass is milled to the dimension called for on the rod dimension blank. During the milling operation this dimension is frequently checked with inside micrometers to insure that the distance will be the same as the rod width. The micrometer dial on the elevating screw of the machine is set to zero after the milling of the first lower flange has been completed and a memorandum is made of the reading at the completion of the first upper flange. These readings are used when milling the flanges on the other faces of the brass.

The rod bearing surface between the flanges is then milled, after which the fixture is indexed one half turn and the opposite flange and the rod bearing surface are milled. The table elevation for the flanges is governed by the previous dial settings. The width between the two rod bearing surfaces is carefully measured with outside micrometer calipers to insure that this distance will be the same as called for on the dimension blank. The fixture is then indexed one quarter turn, after which the front flanges and the bearing surface between them are milled. The same operation is repeated for the opposite end. The brasses are then stamped to designate the rod to which they belong and also with the workman's initials.

One of the novel features of this practice of fitting rod brasses is the fact that the man who mills and measures the brasses seldom sees the rod into which they are to be placed. Old brasses within certain limits are reclaimed by sweating liners on them and machining to fit in much the same way.

Correct fits require accuracy of measurement on the part of one man and accurate machine work on the part of another. It has been found that the men soon become proficient in these methods, so that they can make fits which require no filing other than to remove the burrs.

Machining front main rod brasses.

The front main rod brasses are semi-finished in the manufacturing shops in the same manner as the rear brasses, with an allowance of about 1/8 inch for final finishing. The top and bottom surfaces of the brasses that fit the rod jaws are milled according to the dimensions called for on the dimension blanks. The general plan of milling is similar to that described in connection with rear brasses. The sides of the front brasses are at times ground on the surface grinder when truing the sides of the rods. Old front end brasses within certain limits are reclaimed the same as are the back end brasses.

After the milling of the brasses has been completed and such minor work as wedge repairs, re-reaming taper holes, etc., is finished the brasses, wedges and necessary parts are placed in the rods. They are then stored until the sizes for boring the brasses are available. Owing to the interchangeability of the rods on locomotives of the same class, it is not necessary to replace the rods on the same locomotive from which they were removed. A considerable number are thus always on hand in the shop ready for the final boring for the crank and crosshead pins. The locomotive number is stencilled on the rods after the pin fits have been bored.

Boring crank and crosshead pin sizes.

The sizes for the boring of crank and crosshead pins are taken from the dimension blanks shown in one of the illustrations. When boring and facing the rear rod brasses, they are held in a special fixture on a 36-inch vertical side boring mill. The tightening of the fix-

ture automatically centers the brass on the machine table. It is then bored to micrometer sizes which are 0.010 inch larger than the crank pins as called for on the dimension blank. The top side is faced while in the fixture and, after a second chucking, the bottom side is faced so that the distance between the faces is the same as called for on the dimension blank.

Fig. 17. — The driving rods are repaired in the north end of the machine bays.

Repairing driving boxes.

After removing the driving boxes, they are cleaned and forwarded to the driving box section located in the west machine bay. The machines and work are arranged in the box gang so that the boxes always move forward without back traveling. The cellars are removed and the brass and babbitt side bearings are examined and, if not satisfactory, the brasses are removed in a 70-ton motor-driven hydraulic press.

The shoe and wedge faces are examined and, if found worn or if the two faces are not in proper alinement, the boxes are sent to the planer for refacing. The boxes are bolted in a double row against an upright center piece, the sides of which are parallel to the center line of the table of a 48-inch by 16-foot planer, the lower shoe or wedge faces of the box resting on a parallel strip. The general practice is to load the planer with as many boxes as can be selected having approximately the same distances between shoe and wedge faces, in order to machine the greatest possible number at one time. After finishing one face, the boxes are reversed and the opposite surface refinished.

On the average about 150 driving boxes are always undergoing repairs in the box gang. Thus, it is possible to select boxes having approximately the same amount of wear below the standard dimensions. The odd sizes are held for later matching with boxes of similar sizes, so that it is practically never necessary to operate the planer with less than a capacity load. This condition has been made possible by the fact that a driving box need not go back on the locomotive from which it was removed.

Fig. 18. — With the use of this jig the four faces and the corners of a main rod brass can be milled with one set-up.

Fig 19. — Turning two driving box brasses in a lathe at one set-up.

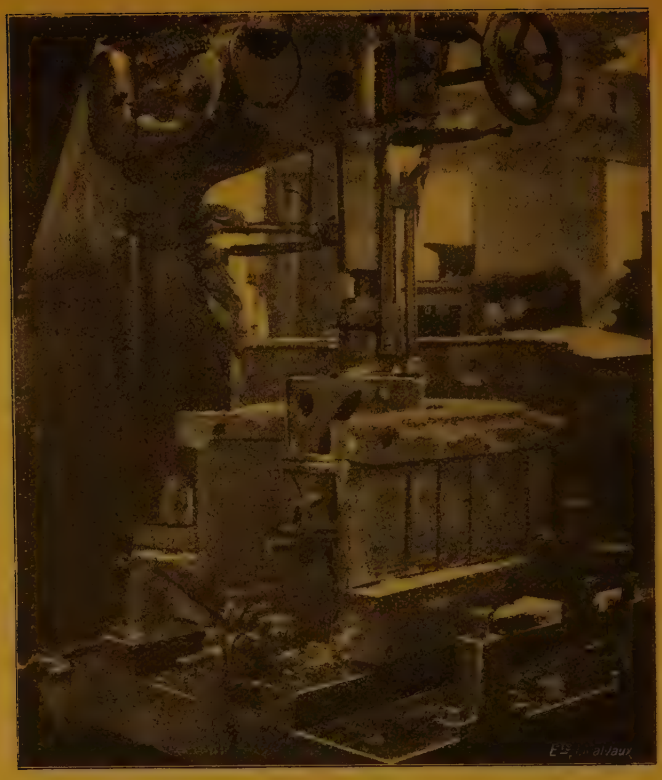


Fig. 20. — Jig for milling the grease grooves in a driving box brass.

Fig. 21. — One of the boring mills for machining crown brasses. The three-pronged micrometer shown is used by the operator to determine the final bore in thousandths of an inch.

Turning the outside of driving box brasses.

The size of the recess for the brass in the driving box is measured with micrometers and set down on a dimension blank. The size for turning the outside of the brass is taken from this data. The brasses are turned, two at a time on a 30-inch by 12-foot lathe, which is equipped with two tool posts on the carriage, one for each brass.

The arbor on which the two brasses are held has one central fixed flange common to the two brasses and two movable flanges, each adjustable by a nut in order to accommodate varying lengths of brasses. The brasses are held between the flanges by cup-pointed set screws located in the flanges, the points of which bear against the ends of the brasses.

When loading the arbor, a block or filler piece is placed on the arbor, which also rests against the inside crown of the brass, locating it to the correct radius. The two brasses are rough turned and the tools are then set to the correct size and the finish cut taken. The advantages of the double arbor are the better running balance of the lathe and the saving of time.

The brasses are afterwards slotted for end size and then pressed into the driving boxes. The babbitt side bearings are then removed by placing the box in melted babbitt at the babbitt furnace, after which the new babbitt is applied. The box is then repaired at the cellar fit and a previously repaired cellar is then put in place. After these operations the boxes are stored awaiting the sizes for the final boring and facing. Owing to the large number of locomotives in the shop, the repair operation on the driving boxes up to this point is flexible. There is never any delay for want of driving boxes ready for boring and facing and the box sizes for laying off the shoes and wedges are available as soon as the locomotive is placed on the repair track so that the scheduling of this item is not of much moment. When box sizes are furnished the erecting shop, the boxes are stencilled with the locomotive number, wheel number and box location after which the box assumes identity.

Boring and facing driving boxes.

The sizes for the boring of the driving boxes and the facing of the babbitt hub plates are set down on dimension blanks, as shown in one of the illustrations, by the inspectors when inspecting the driving wheels. The blank is then given to the driving box gang foreman who picks out the set of boxes for that locomotive, having stencilled on them the locomotive number and journal location whose pedestal fit sizes he has furnished the erecting shop previously and the boxes are then bored and faced to conform to the journal chart.

The boxes are bored and faced on a special driving box boring mill, which is equipped with a special heavy two-jaw universal chuck amply strong to hold the box under the heaviest cut. The box is held on the two shoe and wedge faces by the chuck jaws which, when tightened, bring the vertical center line of the box into line with the turning center of the machine. The chuck with the box in place is adjustable in relation to the machine table in line with the vertical center line of the box.

The roughing and finishing boring tools are held in a large adjustable boring bar similar in design to that used for car wheel boring. The hub liner is turned with a tool held in the side head. When starting the work, the driving box with the cellar in place is lifted with a jib crane into the mill and tightened in the chuck, which is adjusted by a single screw to bore the desired amount from the crown of the brass. The height of the side cutting tool is set from the

lower surface of the upper flange of the box. The dimension for this setting is taken from the wheel dimension blank. The cutting tools in the boring bar are set for the roughing out by the micrometer dial on the boring bar.

The brass and the walls of the cellar are then rough bored and at the same time the box is faced to size. The boring bar is then raised and the chuck shifted to bore 1/32 inch higher in the crown in order that the cella will not come in contact with the journal. The finishing cut is then taken and at the same time the fillet is turned on the brass with the back side of the side head tool. The cellar is removed and after resetting the box and tool, an axle clearance cut of 0.02 inch is taken from the bottom part of the brass sides. After the completion of these operations, the diameter of the bore is checked with a special three-pronged micrometer. The box is then removed. Attention is called to the fact that the only measurements made are after the completion of the machine operations, a condition made possible by the micrometer measurements. The advantage of the method is reflected in the time taken to complete the boring and facing of a driving box, which under every-day conditions is less than 25 minutes from floor to floor. Owing to the close tolerances to which the work is done, the operation of spot facing to the journals is not necessary. After this operation, grease grooves are milled in the crown brass and the box and cellar assembled and delivered by a jib crane to the wheel gang. The method of handling boxes is typical of the manner of sequence in which the different repair operations are performed on the locomotive parts.

The valve motion work is sent to the proper repair gang where all the parts are checked for size by means of micrometers and gages. Particular attention is given to the piston valves. They are dismantled and checked by limit gages and if found below the limit they are scrapped. The bull rings are fitted up with packing rings according to the size of the valve bushings, which are bored out twice in steps of 1/8 inch each before renewing, giving a maximum diameter 1/4 inch over size. The boring heads for this work are kept in the toolroom where the tools are ground and set to bore the proper diameter of piston valve bushings.

Conclusion.

The arrangement of the shop layout, the selection and location of the machine tools and shop equipment and the methods of handling the work which were described in this article were planned by the officers of the mechanical department under the direction of J. T. Wallis, chief of motive power. During the month of December, 1925, which contained 22 working days, 102 locomotives received classified repairs. In this number were two Class 1, 16 Class 2, 30 Class 3, 17 Class 4, 25 Class 5 and 13 heavy running repairs.

[385 .113 (.43)]

The German railways and the results of the first year's operation under the Dawes plan, (1)

Figs. 1 to 14, pp. 1113 to 1124.

(*Revue Générale des Chemins de fer*, February 1926.)

Mr. G. Leverve, Commissioner of the German Railways, has just submitted to the Reparations Commission his report on the first year's application of the Dawes Plan.

The report was drawn up in order to give some particulars of the results obtained by the « Reichsbahn-Gesellschaft » during the first year's working in accordance with the Plan of the Experts, and to set out at the beginning of the second year, in the light of the experience therefrom obtained, the conditions under which it must be operated in view of the charges the German Railways have to meet.

Having dealt with the Reparations payments, the report notes the first operating results of the Company and its financial position : it considers the development of traffic and the evolution of rates, and gives some information of the cost to the Company of staff, rolling stock and permanent way.

A detailed analysis of the second part of the report is given below : so far as the Reparations payments are concerned the following brief notes only will be given.

During the first year of the Plan which ended the 31 August 1925 the Reparations payments amounted to a milliard of marks, 200 millions coming from Railway stock and 800 millions from the German foreign loan.

For the second year of the Plan, Reparations payments are fixed at 1 milliard 220 millions of gold marks which are to be produced almost exclusively by the Railway Company, and made up as follows :

1. — Payment by the « Reichsbahn » as interest on the Reparations stocks . .	595 millions.
2. — Transport tax	250 —
3. — Payment to be provided for in the « Reich » budget which in lieu will receive the proceeds of the sale of preference stocks of the Railway Company	250 —
4. — Six months interest on industrial stocks	125 —
Total. . .	1 220 millions.

The three first heads affect the Railways.

The first concerns the payments to be made out of the « Reichsbahn's » re-

(1) See *Revue Générale des Chemins de fer* for September 1925, p. 239.

ceipts. The second is obtained from the tax on transport fixed at 7 % of the gross receipts from the carriage of freight other than coal, and at a rate varying from 10 to 16 % of the passenger traffic receipts, certain scholars' and workmen's season tickets being excluded. With regard to the third heading an agreement was made between the Finance Minister of the « Reich » and the « Reichsbahn » as to the preference shares.

Financial operating results.

The first financial year was from the 1 October 1924 to the 31 December 1925, that is to say, fifteen months, and the accounts will not be available before the spring of 1926. At present therefore only the provisional operating figures for the eleven months, from the 1 October 1924 to the 31 August 1925, supplied by the Company are available. These results may be summarised as follows :

		Thousands of Reichsmarks.
Operating receipts		4 033 050
Operating expenses	Staff 2 154 290	
	Material 1 113 694	
Extraordinary expenditure	268 016	
Interest on short date loans	7 700	
Interest on Reparations stocks for the first year	200 095 (1)	
General total expenditure		3 743 895
Excess of receipts over expenditure		289 255

Figure 1 brings out the progressive increase in receipts of all kinds.

Taking the real operating expenses (3 267 millions 984 000 mk.) and the receipts (4 033 millions 50 000 mk.) the operating ratio appears to be about 80 %, the figure expected by the experts.

After having met the extraordinary expenditure (268 016 000 mk.) interest on short date loans (7 700 000 mk.) and the first year's Reparations payments (200 095 000 mk.) the balance left is 289 255 000 mk.

As provided in the Plan, the Company, after having met the Reparations payments which were made intentionally small for the first year, must put to reserve 130 millions of marks towards the second year's Reparations payments, which are much greater : 595 millions of gold marks.

In addition, the « Reichsbahn » must in accordance with article 25 of its statutes form a reserve fund in order to meet any future deficit in operation, and to cover interest and amortization charges on the Reparations stocks. 2 % of the gross receipts have to be allotted to this fund annually until it amounts to a maximum of 500 millions of gold marks. So that from the receipts, 4 033 millions 50 000 mk., of the first eleven months' working, the Company has to put 80 millions of marks to this legally formed reserve.

The excess of receipts over expenditure shewn above (289 millions of marks) is amply large enough to meet the payment of 130 millions carried forward to the second year, and the reserve of 80 millions required by law.

In addition, part of the Preference stock to the nominal value of 624 millions has been tranferred to the « Reich »,

(1) The difference between this figure and the sum of 200 millions of gold marks provided for in the Plan is due to the rate of exchange at the dates payments were made.

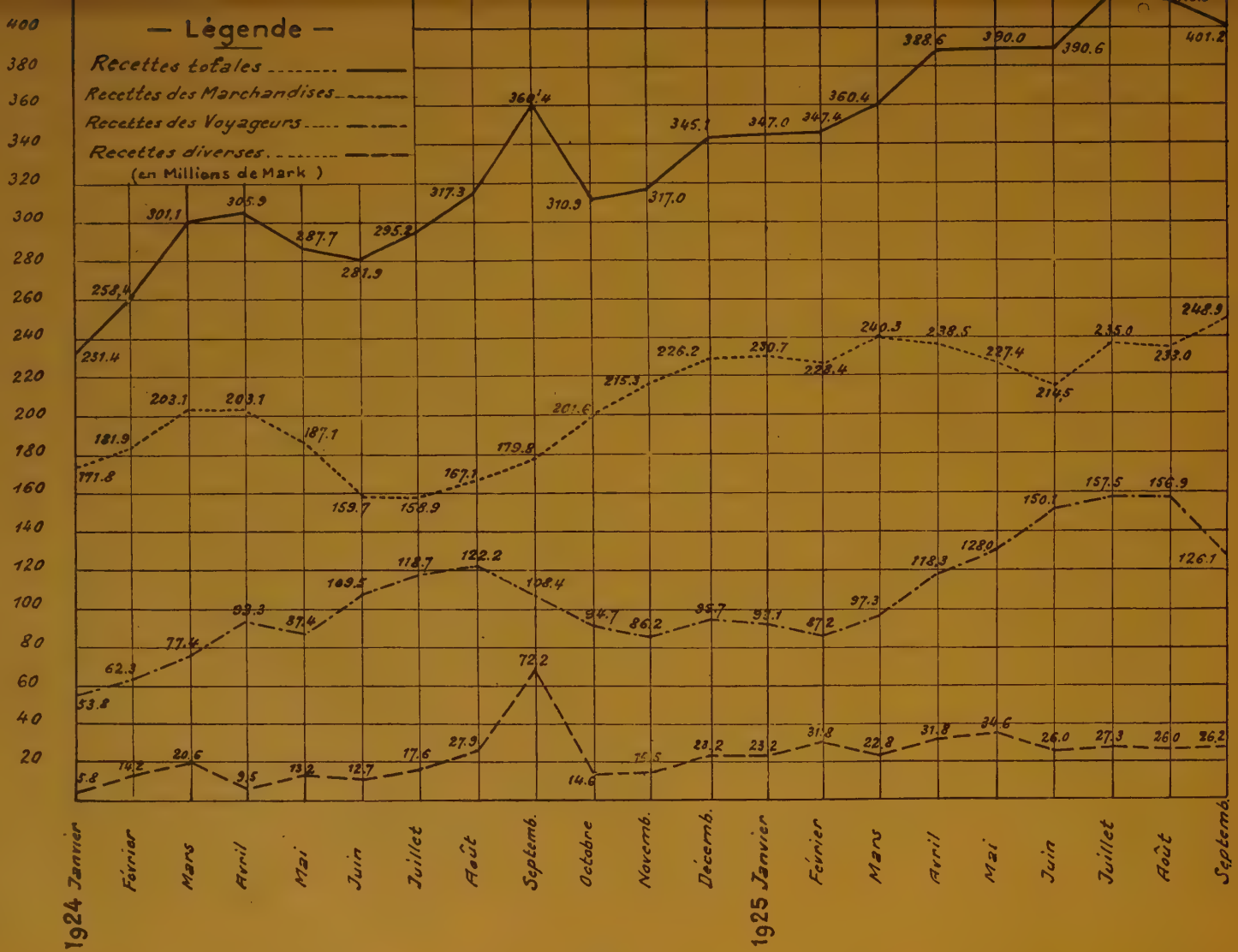


Fig. 1.

Explanation of French terms : Légende = Description. — Recettes totales = Total receipts. — Recettes des marchandises = Goods receipts. — Recettes des voyageurs = Passenger receipts. — Recettes diverses = Miscellaneous receipts. — En millions de marks = In millions of marks.

on which the preference dividend of 7 % will have to be paid as from the beginning of next year.

It can be concluded, according to the report, that the first opening results of the « Reichsbahn » have been satisfactory, and that they have confirmed the estimates made by the experts.

General traffic situation.

In spite of the economic crisis which Germany is now experiencing as a result of inflation, railway traffics are almost equal to those of pre-war days in volume. The tonnage of goods carried is only 9.6 % less than that of 1913, when allowance has been made for the traffic of the territory lost under the Peace Treaty, and the ton-kilometres are up 10 % due to an increase in the average length of haul of goods traffic. So far as passenger traffic is concerned, the number of passengers carried in 1924 was 23 % higher than in 1913.

A general note is made that the traffic figures of 1913 given in the report have been prepared by the Statistics Office of the « Reichsbahn », allowance having been made for territory lost as a result of the war. Naturally any adjustments made in such a way can only be approximations.

Figure 2 shews the tonnage of goods carried monthly, as well as the ton-kilometres and the number of wagons loaded as from the 1 January 1924.

The increase in goods traffic was very marked during 1924, especially during the period July to November inclusive. Trade activity in Germany was then recovering from the monetary failure, both industry and commerce rapidly recovering their strength under the stimulation due to the Conference of London and the political and financial agreements resulting therefrom.

As from November 1924 the Ruhr-Rhenan lines were restored to the Railway Company and their traffic made good the falling off in traffic usually noted between December and March.

In 1925, traffic became steadier with much smaller changes, and to-day it continues to be only slightly less than pre-war, as has been noted already, due no doubt to the economic crisis still existing in Germany.

After these general remarks the report considers with some detail the present transportation position, and especially the elaboration of passenger and goods rates which, in view of their effect on the general activity of the country, are in Germany, as elsewhere, the subject of much public discussion.

a) Passenger traffic.

During the inflation period when the rates were far too low the passenger traffic in Germany increased enormously. The number of passenger-kilometres increased from 36 599 millions (22 742 millions of passenger-miles) in 1913 (excluding ceded territory) to 73 962 millions (45 959 millions) in 1922 and to 63 157 millions (39 245 millions) in 1923; hat is to say, an increase of 102 % for 1922 and 72 % for 1923.

As was foreseen, the stabilisation of the mark and the introduction of rates on a gold basis resulted in a reduction of the number of journeys made. During the period of the 1 April 1924 to the 31 march 1925 the German Railways carried 1 951 483 895 passengers as compared with 1 576 900 000 in 1913 (ceded territory excluded) which is equivalent to an increase of only about 23.7 %. The number of passenger-kilometres increased from 36 599 millions (22 742 millions of passenger-miles) in 1913 to 44 952 millions (27 932 millions) in 1924-1925, or an increase of 22.8 %.

Since the 1 April 1925 the passenger traffic has continued to develop thanks to the steps taken by the Company with regard to the services given and the rates charged. The number of express

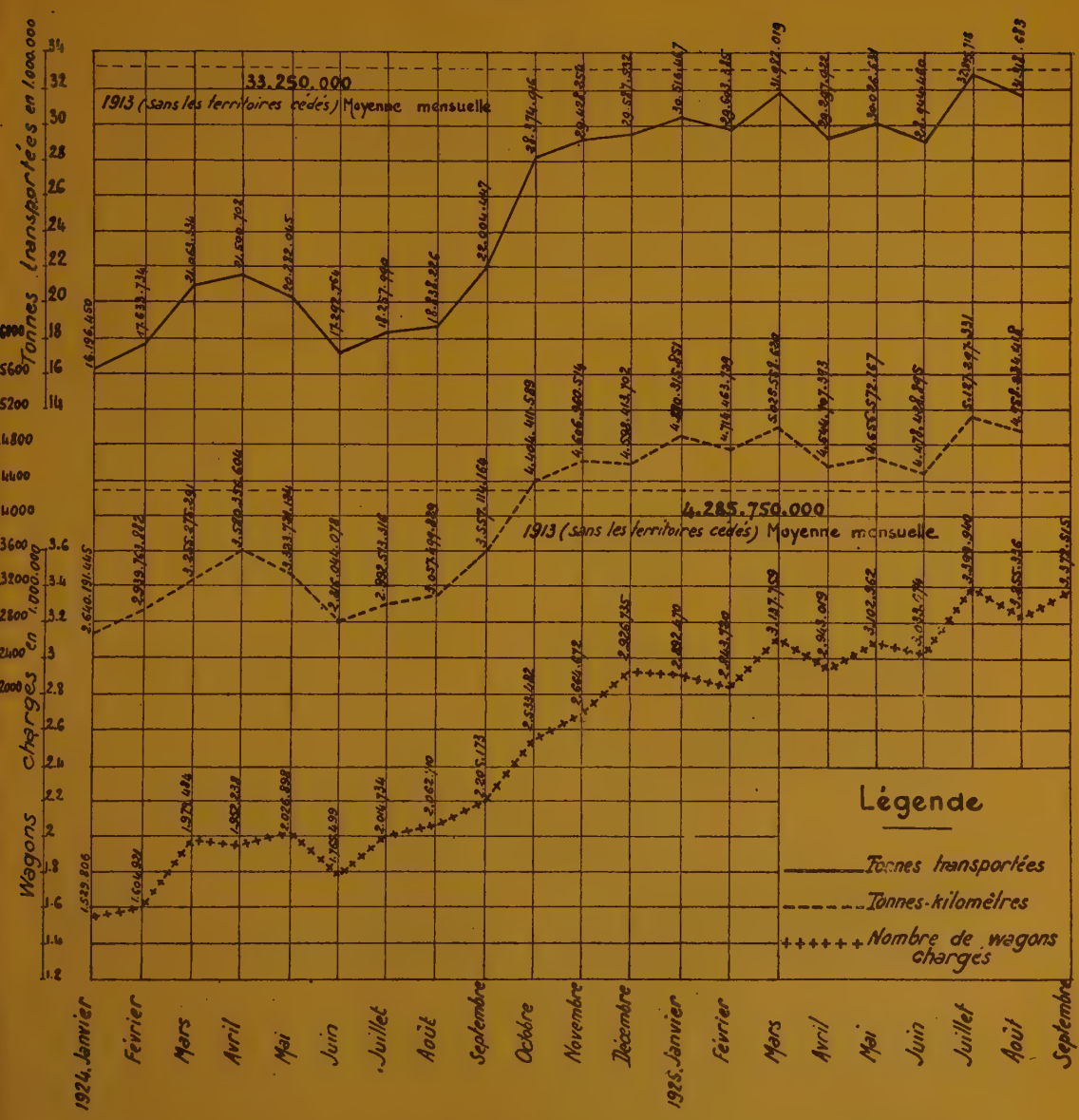


Fig. 2.

Explanation of French terms : Tonnes transportées = Metric tons carried. — Tonnes-kilomètres = Ton-kilometres. — Nombre de wagons chargés = Number of loaded wagons. — 1913 (sans les territoires cédés) Moyenne mensuelle = (less ceded territories) Monthly average. — Tonnes-kilomètres en 1.000.000 = In millions of ton-kilometres.

and stopping trains has been increased, although the pre-war frequency has not yet been reached, their speed has been increased and international services have been improved. Long distance fast express trains, which make few intermediate stops (Fernschnellzüge) have been introduced. Special Sunday excursion and holiday excursion trains have been provided. Reduced fares have been given to societies travelling in parties as well as to emigrants. Sunday return tickets previously only issued in large cities can now be obtained in many small towns.

As a whole the average length of passenger journeys has not changed, being 23.03 km. (14.30 miles) as compared with 23.21 km. (14.42 miles) before the war. A downwards tendency of passengers to travel by the cheaper classes has been noted, 58.1 % of passengers travelled 4th class against 50.7 % in 1913, the other three classes shewing reductions.

There has been an increase in the journeys at reduced rates, these producing 34.6 % of the total passenger-kilometres as compared with 24.1 % before the war. These two changes have adversely affected the receipts of the railway.

Changes in passenger rates. — Rates on a gold basis were introduced on the 1 November 1923; the third and fourth class rates which yield about 85 % of the total receipts were at that time fixed at 10 % (tax included) above the pre-war rates, whereas in the case of the first and second class rates the increases were 183 and 120 %.

The result of this excessive surcharge on the higher classes was a movement towards the lower classes. Theses rates could not be maintained, and they were altered the first time the 1 December 1923, and on the 1 March 1924 were replaced by the new rates which remained in force until the 1 May 1925 : at this latter date passenger rates were increased by 10 % to meet the increase of wages granted by the Company.

The increase in the cost of travelling at ordinary rates (including tax) as compared with that of 1913 is as follows :

	1 March 1924.	1 May 1925.
1st class	23 %	38 %
2nd class	40 %	59 %
3nd class	47 %	62 %
4th class	50 %	65 %

Taking into account the distribution of passengers amongst the different classes, the average increase paid by a passenger at full rate appears to be 48 % at the 1 March 1924 and 63 % at the 1 May 1925. When allowance has been made for the movement towards the lower classes noted since the war, the average receipt per passenger-kilometre at full rate (tax excluded) has only increased by 24 % at the 1 March 1924 and 38 % at the 1 May 1925.

The system of special reduced rates : season tickets, return tickets, etc., has been more developed than in pre-war days especially with a view to assisting the less well off classes to travel. With this object, fourth class monthly season tickets, fourth class scholars' tickets, weekly fourth class and workmen's three day season tickets have been introduced. Furthermore, scholars' return tickets and fourth class return tickets for Sundays have been instituted. Other concessions, such as those given in 1913 for parties of young people and for societies, have been applied generally.

The proportion of journeys at reduced rates has very largely increased, the average receipt per passenger-kilometre has gone from 1.28 pf. (2.06 pf. per passenger-mile) in 1913 to 1.09 pf. (1.75 pf.) in 1924-1925, or a reduction of 14.8 %. Whereas the average receipt per kilometre of passengers at normal rates had increased at the 1 March 1924 by 24 % as compared with 1913, the

receipts from passengers travelling at reduced rates had fallen off by 14.8 % thereby reducing materially the effect of increasing the normal rates.

Taken as a whole, the average receipt per passenger-kilometre of all kinds, at normal rates as well as at reduced rates, increased from 2.36 pf. (3.80 pf. per passenger-mile) in 1913 to 2.56 pf. (4.12 pf.) in 1924-1925, or by 8.5 %. Taking luggage into account the receipts per passenger-kilometre increased from 2.47 pf. to 2.65 pf. (3.97 pf. to 4.26 pf. per passenger-mile) or by 7.28 % only.

These increases were seen to be too small, particularly as in Germany wages had increased since 1924. On the 1 April 1925 when the wages of railway servants were increased at a cost to the Company of 36 million mk. it was decided to increase monthly and weekly season tickets rates 25 % and suburban seasons at Berlin and Hamburg 33 %. Finally the 1 May a 10 % increase was made on the reduced rates as well as on the ordinary rates, except on the Berlin and Hamburg suburban season fares.

As a result of these increases it is estimated that the receipts per passenger-kilometre should amount to 2.88 pf. (4.63 pf. per passenger-mile) and if luggage be included to 2.98 pf. (4.80 pf.) (tax excluded) which shews an increase of 20.6 % as compared with 1913.

From the above it does not appear that passenger rates as a whole are too high in Germany when the cost of living is considered. Actually the receipts per passenger-kilometre for the whole traffic has increased 20.6 % since 1913 : the tax on passenger traffic can be evaluated at 11.5 %, whereas before the war it was about 2.5 % on the average. On the whole the average price paid per passenger can be said to have been increased by 30 %, that is to say, by less than the index of the cost of living which last August reached 145 as compared with 100 in 1913.

Furthermore, if the increases made since 1914 on the normal passenger rates, excluding express train supplements, in Germany are compared with those of other European countries with appeciated currency, the following figures as at May 1925 are obtained :

	Increase in passenger rate per 100 km.		
	1st class	2nd class	3rd class
Germany	38 %	59 %	62 %
Sweden	177 %	131 %	131 %
Holland	99 %	99 %	97 %
England	23 %	58 %	48 %
Switzerland	44 %	43 %	44 %

The very great increases noted in Sweden and Holland are explained by the passenger rates in these countries having been much lower in pre-war days than those of other countries.

Figures 3 to 8 enable a more complete comparison of the cost of journeys by the different classes, before and since the war in different countries, to be made.

Finally, it must not be forgotten when making this comparison that in Germany the 1st class is hardly used (3 first class in every 10 000 passengers) and that there is a fourth class at very low rates which is much used (5 814 fourth class passengers out of every 10 000 passengers), whereas there is no fourth class in the other countries.

b) **Goods traffic.**

The goods traffic carried by the German Railways has varied in volume very considerably during the post-war period following the fluctuations in the trade of the country.

In 1922-1923 the trade activity was very greatly helped by the progressive depreciation of the mark, the tonnage carried reaching a maximum of 385 million tons or only 3.5 % less than in 1913, the ton-kilometres reaching 62 550 millions (38 254 million English ton-miles) or 20 % above that of 1913. This favourable traffic position changed in 1923

with the occupation of the Ruhr and the collapse of the mark.

In 1924, the first year the mark was stabilised, the German railways carried 267 970 000 t., a diminution of 32.8 % as compared with 1913, when it can be estimated at 399 million t., ceded territory being excluded. The results obtained in 1924 were naturally affected by taking away the Ruhr-Rhenan system, situated in the most important manufacturing district of Germany.

During the first six months of 1925, the tonnage carried has averaged per month 30 062 000 t. which represents a falling off of only 9.6 % compared with the monthly returns in 1913. In the period January-June 1924, the mean monthly tonnage carried was 19 million 413 000 t.: the increase in tonnage carried in 1925 for the corresponding period is therefore 54.9 %.

If ton-kilometres, the real unit of traffic and receipts, are considered, the number in 1924 is 41 227 millions (25 213 million English ton-miles), a falling off of about 19.8 % as compared with 1913, when excluding ceded territory it was 51 429 millions (31 452 million English ton-miles) (service tonnage excluded).

In the period January-June 1925 the average monthly ton-kilometres was 4 716 millions (2 884 million English ton-miles) an increase of 49.7 % on 1924 and 10 % above that of 1913.

If the actual tonnage carried is slightly less than in 1913, whereas the ton-kilometres are higher, the reason is the increase in the average haul of goods as compared with 1913. The average distance was 129 km. (80 miles) in 1913, 153.8 km. (95.6 miles) in 1924, and during the period January-July 1925, 156.9 km. (97.5 miles). The increase in the length of haul since the war has been due to changes in the currents of traffic especially as regards the supply of raw materials, and also no doubt to the introduction in 1920 of rates decreasing with the distance which allowed material of low value to be carried great distances.

It is obvious that a falling off of the average distance goods are hauled might affect the receipts adversely : it would therefore not be opportune to alter the rates in any way that would result in a falling off of goods carried long distances.

It will be interesting to give below the traffic divided as between interior, foreign and transit :

	Monthly average in 1913 (in 1 000 English tons) (1).	Percentage of total.	Monthly average Jan-June 1925 (in 1 000 English tons).	Percentage of total.
1. — Interior	35 183	85.60	24 287	82.09
2. — Foreign :				
a) Exportation	3 936	9 58	2 601	8.79
b) Importation	1 907	4.64	2 649	8.95
3. — Transit.	73	0.18	50	0.17
Total.	41 099	100.00	29 587	100.00

(1) Ceded territory traffic included.

The carriage of coal has been said to be the « Backbone of the traffic on the German Railways» . In 1913 it amounted to 39.8 % of the total goods tonnage, and

in the first five months of 1925 to 37.2 %. In these figures lignite, which amounted to 19 % of the total in 1913, is now 34 % of the total coal carried.

Before dealing with rates questions, the report calls to notice that the Company has taken energetic steps to improve the transport arrangements so as to develop traffic, and to meet the severe road competition by motor vehicles with which it is faced specially in the Ruhr and Rhenan districts. The speed of goods trains has been increased from 30 tot 40 km. (from 18 to 25 miles) an hour on all the principal lines. Express goods trains, made up to 90 axles, and whose speed has been increased from 50 to 60 km. (from 31 to 37 miles) an hour, run between the chief towns and enable goods to be delivered the day after despatch, even between far off towns, such as Berlin, Cologne, Hamburg, etc.

Development of goods rates. — In November 1923, the « Reich » Railways decided to apply rates on a gold basis at about double those of pre-war (tax of 7 % included). Since January 1924 the Management, with a view to assisting in the restoration of trade, seriously affected by the crisis following the stabilisation of the mark, restored a large number of special rates, and granted in turn the following reductions which applied generally : reduction of 8 % the 30 January 1924, 10 % the 1 March 1924, and 10 % the 18 September 1924. At this latter date the increase of weight charged in the case of goods carried in covered wagons was reduced from 10 % to 5 %.

Since the formation of the Company the ordinary rates have not been altered, but many reductions have been made in the special rates. The extent to which special rates are used may be judged from the fact that in March 1925, for example, special rates applied to 38.6 % of the total goods receipts, to 58.2 % of the total tonnage and 56.3 % of the total ton-kilometres. The most important of the charges made in the special rates may be briefly stated as below :

In order to increase the quantity of coal sent to North Sea and Baltic districts, on the 5 May 1925, two special rates were put in force for coal from the Ruhr and Upper Silesia to these parts. These rates were as much as 28 % and 22 % less than the ordinary coal rates. They were granted in return for a guaranteed minimum tonnage given by the Ruhr and Silesia Syndicates. So far as coal is concerned, another reduction of 10 % was given the 1 April 1925 for coal carried from the Ruhr to the Siegerland, an industrial area at a disadvantage owing to its distance from the coal field and to the cost of mining iron ore. Special rates have also been granted in order to help ship building, and for the carriage of graphite from Bavaria, and iron ore from Upper Silesia, as well as tranship rates to the Danube ports.

To make up to some extent for the loss of receipts following on the above mentioned reductions, the Company on the 1 August 1925 increased by 30 % the rates on stone used in road and canal construction.

Rates to and from the seaports to help imported and exported goods were suppressed at the end of the war; they were restored at the beginning of 1924. These rates were not affected by the general reductions made in March and September 1924, and their value, so far as competition with foreign ports was concerned, was also lessened by the decline in value of certain foreign moneys. For these reasons, during the year 1925 the « Reichsbahn » altered all the rates for seaport traffic by reducing them very appreciably and by applying them to additional categories of goods. These steps helped the German ports to compete with the Belgian and Dutch ports,

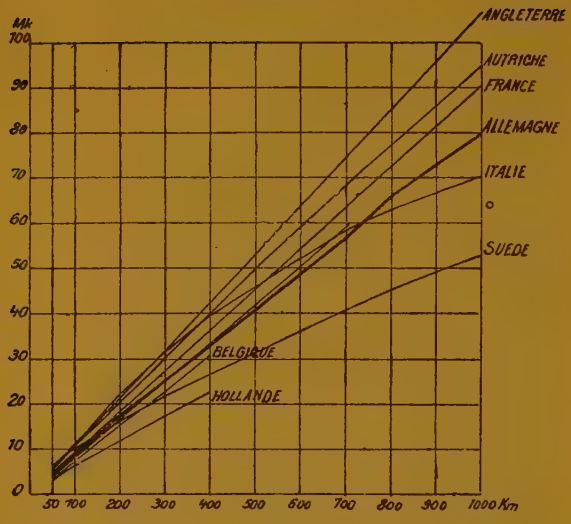


Fig. 3.

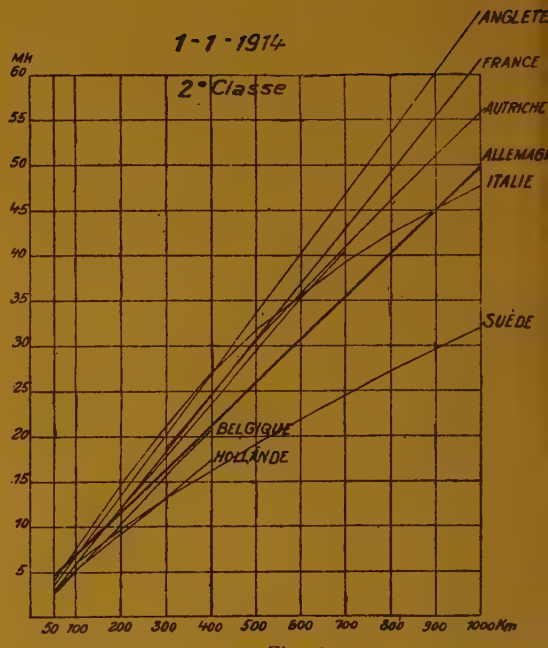


Fig. 4.

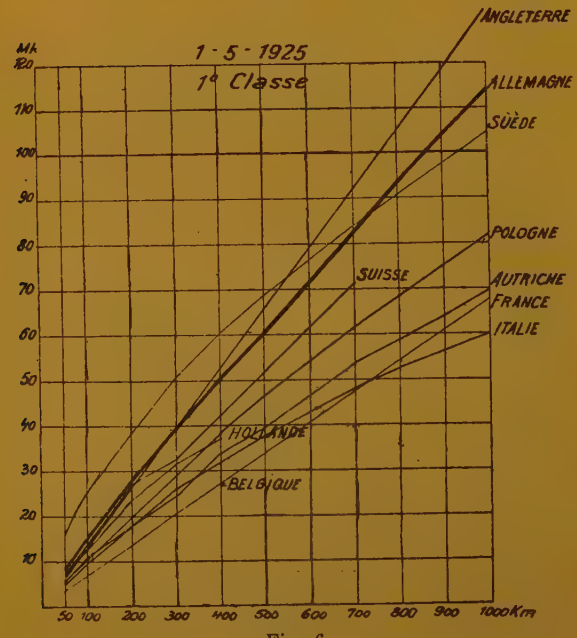


Fig. 6.

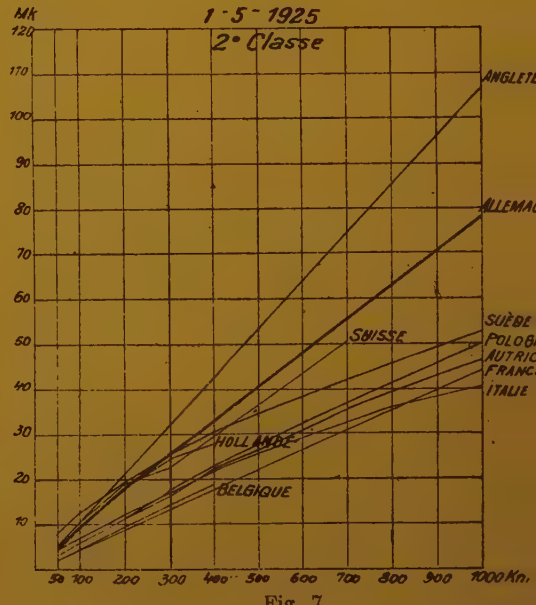


Fig. 7.

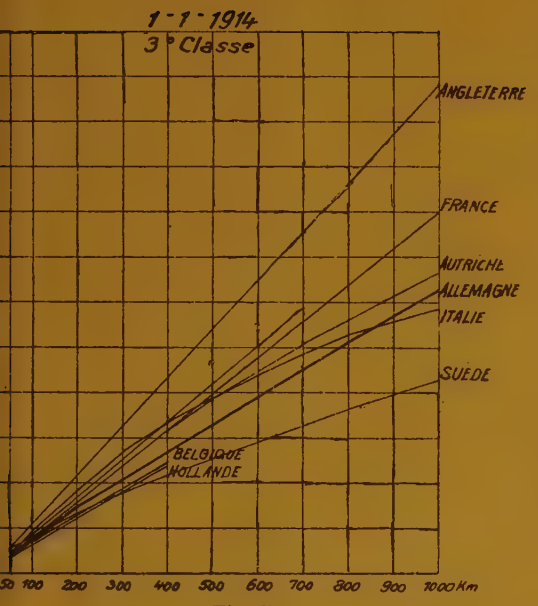


Fig. 5.

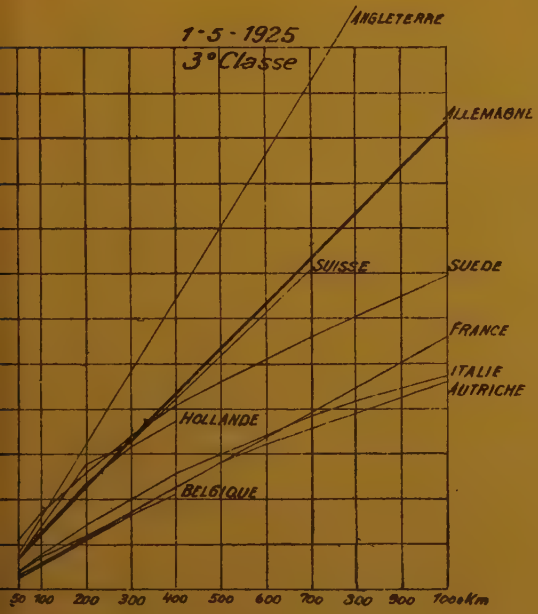


Fig. 8.

as well as with Trieste. As is known the provisions of article 325 of the Treaty of Versailles ceased to be effective on the 10 January 1925. The Allied powers could no longer demand the same reductions in rate to their ports as were given to German ports. The success of the last reductions is shewn by the fact that the tonnage carried after the special ports rates were granted increased from 227 108 t. (223 521 English tons) in July 1924 to 423 811 t. (417 117 English tons) in July 1925; it is true that the increase must also be attributed in part to the fact that the Company had resumed its operation of the Ruhr-Rhenan lines.

Quite recently, to help the Government in its struggle against the high cost of living, the Company has given a special reduction of 10 % on the rates for food stuffs, the reduction applying from the 1 October to the 31 December 1925.

During the last year the German Railways have made very serious efforts to increase their transit traffics. With this object in view, transit rates have been largely reduced and they have been frequently altered so as to meet the competition of the foreign lines which surround Germany.

The success of this rates policy of the Company appears to be shewn by the steady increase in the tonnage in transit, it having increased from 28 000 t. (27 560 English tons) in November 1924 to 57 900 t. (56 990 English tons) in June 1925.

Since its formation the Company has taken steps to fix rates for direct traffic with foreign countries in order to facilitate international traffic. With this object in view, through rates have been given between Tcheco-Slovakia and the German ports; other through rates have been arranged with Holland, Scandinavia, Russia, and the Baltic States, and negotiations are in hand with a view to fixing such rates with Poland, Austria, Hungary and Tcheco-Slovakia.

The report actually divides the development of the rates policy into two periods since the stabilisation of the mark. During the first period to October 1924 successive and important reductions of both nominal and special rates were made. The importance of these reductions is shewn by the fact that the average receipts per ton-kilometre fell from 6.51 pf. (10.64 pf. per English ton-mile) in January 1924 to 4.74 p. (7.75 pf. per English ton-mile) in October 1924.

From this date the Company, instead of pursuing a policy which took into account Reparations payments only, has followed a policy more suitable to the economic life of the country by granting the reductions on the special rates we have spoken of above, and at the same time has endeavoured to increase the traffic by competitive rates. Nevertheless it has wisely abstained from making general reductions in the rates which might have resulted in a serious falling off in the receipts. Actually the mean receipt per ton-kilometre has not fallen off since October 1924 (October 1924, 4.74 pf. [7.75 pf. per English ton-mile]; June 1925, 4.79 pf. [7.83 pf. per English ton-mile].

The increase in the ordinary rates as compared with 1913, is as follows for a distance of 200 km. (124 miles) (the coefficient of 1913 being taken as 1) :

Goods in other than full wagon loads :

General rate	1.59
Special reduced rate	1.59

Goods in full wagon loads :

Class A rate	1.82
Class B —	1.53
Class C —	1.63
Class D —	1.60
Class E —	1.48
Class F —	1.21

If the distribution of the ton-kilometres of goods between the different classes is considered, the mean increase in the ordinary rates, including tax, is equal to 48 %. On the other hand, traffic at special rates amounts to 57.8 % of the total ton-kilometres. These special rates were increased on an average by only 33 % as compared with 1913; the result is that the mean increase on the goods rates as a whole is 42 %.

When it is realised that the index of wholesale prices in Germany in August stood at 131.7 and the cost of living index at 145, it must be admitted that the violent criticisms sometimes heard in Germany against the increase in goods rates were not justified.

On the other hand, the Company, whilst maintaining the ordinary rates at the figures required to meet its expenditure, can be said to have taken serious steps to assist the national economy by granting many and very reduced rates, for certain raw materials, for coal, minerals, and manures, for exported manufactured goods, and to help the German ports.

In addition, by the differential rates dating from 1920, the carriage of materials, especially of raw meterials, to distant areas unfavourably situated from an economic point of view, such as Bavaria or East Prussia, has been facilitated. It is of course true that the carriage of goods for short distances, as in the Ruhr or Saxe has been discriminated against and the competition by road motors thereby assisted.

With a view to meeting certain German economics needs, the « Reichsbahn recently set up a Commission to consider a revision of the rates system : this investigation is one that demands the greatest care, and when being made the legitimate interests of the Railways should not be ignored.

Figures 9 to 14 drawn up from information supplied by the « Reichsbahn » give a comparison between rates in Germany and abroad for some of the most

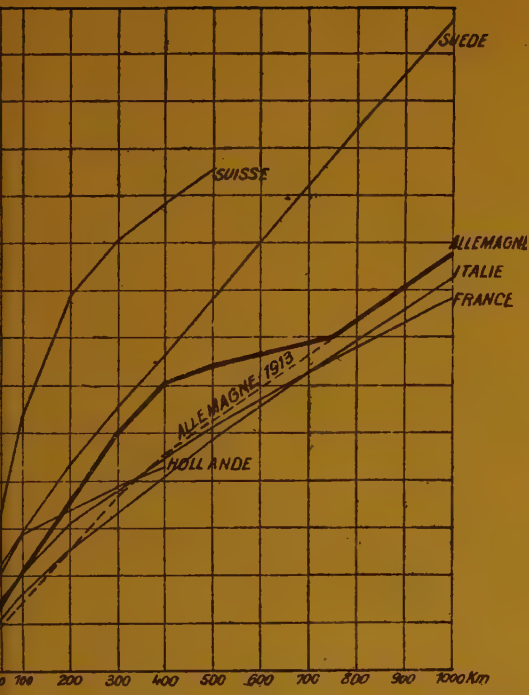


Fig. 9. — Coal.

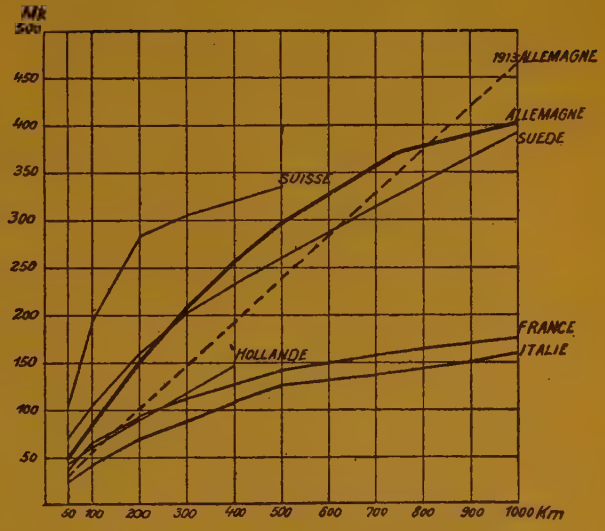


Fig. 10. — Corn.

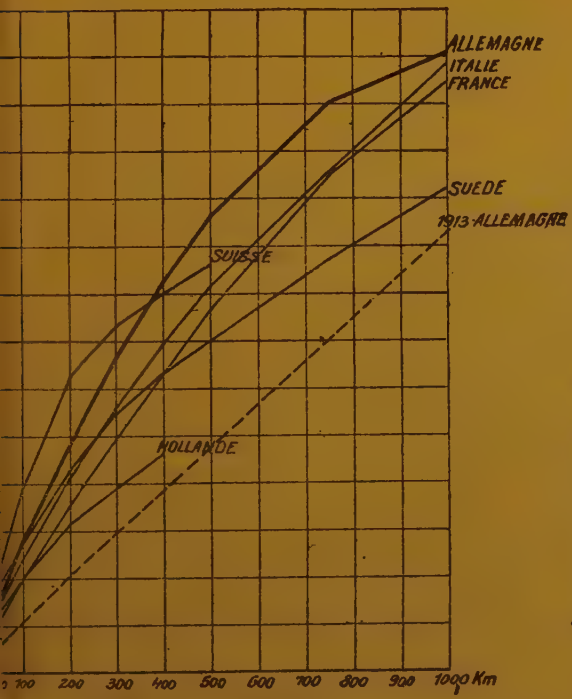


Fig. 11. — Machine-tools.

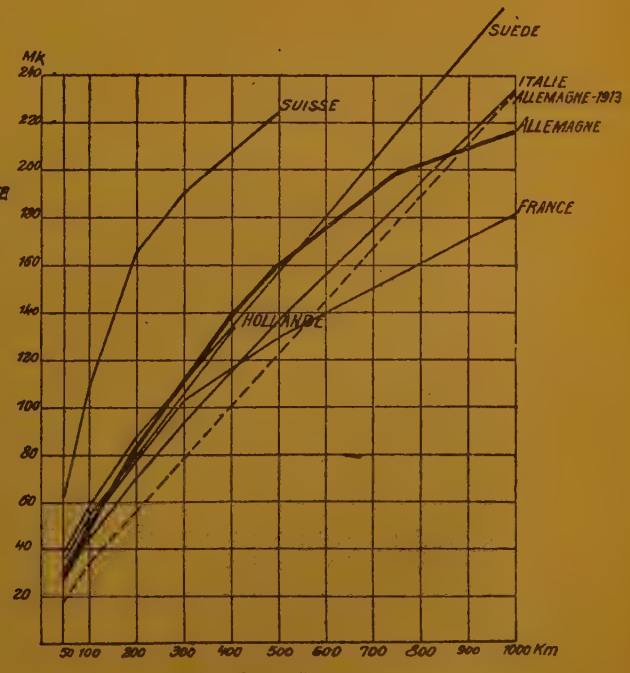


Fig. 12. — Cement.

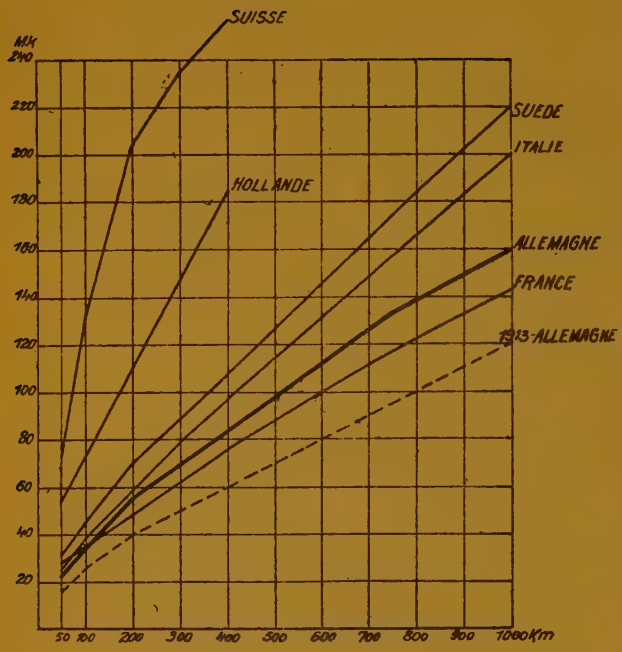


Fig. 13. — Iron ore.

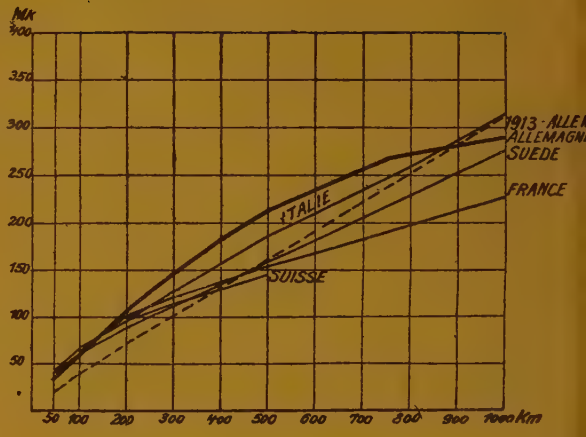


Fig. 14. — Pine logs.

important materials : coal (fig. 9), corn (fig. 10), machine tools (fig. 11), cement (fig. 12), iron ore (fig. 13) and pine logs (fig. 14).

Cost of staff.

The cost of wages forms a considerable part of the operating cost of the railways. The cost of wages for the staff of the « Reichsbahn » for the period 1 October 1924 to the end of August 1925 amounted to 2 154 millions, whilst the cost of supplies came to 1 113 millions, the former being 66 %, and the latter 34 % of the whole, whereas before the war the proportions were 61.2 % and 38.8 %.

Since the 12 December 1923, when the salaries were fixed on a gold basis, those of the staff have been increased at different dates as follows :

1 April 1924	21 %
1 June 1924	23 %
1 November 1924	11 %
1 April 1925	increase of 10 % in the housing bonus.

The wages of the workmen of the Company have been increased similarly : the last general increase on the 15 March 1925 was 3 pf. an hour.

More recently, on the 1 September, the Company made certain adjustments in the housing allowance and the bonuses granted the men, the result of which was an annual increase in expenditure of 27 million mk.

As a whole, the wages of the staff compared with those prior to the war appear to have been increased in a proportion if anything greater than the increase in cost of living. To these costs there has just been added the particularly heavy cost of pensions due to the

policy pursued since the war with regard to the staff, and of which the report gives particulars.

The personnel of the German Railways is divided into two main groups : the staff (*Beamte*) and the men (*Arbeiter*), the latter paid weekly, subject to collective agreements, variations in wages, and liable to be discharged; the former having the advantage of staff regulations which assure them regular promotion, pensions, and permanent employment. The « Reichsbahn » also employs a small number of clerks whose position is intermediate between that of the staff and the workmen.

In 1913, the German State Railways, excluding the territory ceded under the Peace Treaty, employed 263 887 staff and 428 827 workmen and clerks, or a total of 692 714 employees.

In 1919, the Railways which had been forced to take back soldiers after demobilisation, and thereby were made into an enormous charitable institution, had in their service 1 121 745 men. This maximum slowly fell during the following years, but the 1 October 1923 still remained at 1 009 420 men : 425 908 staff, 917 clerks, and 582 595 workmen.

At that date, the financial position of the « Reich » made a reduction essential. The 27 October 1923 the Government issued a special order with regard to the reduction of staff. The general programme of dismissal affected the whole of the staff and employees of the Reich, the States and the towns : it applied directly to the staff and clerks of the railways and indirectly to the workmen by suspending in the case of the latter the powers of the industrial councils which prevented their discharge. The employees had to be given a month's notice before dismissal and also be compensated.

So far as the staff was concerned, the order decreed a reduction of 25 % in the staff as at the 10 October 1923. The reduction was to be made by voluntary retirement or by dismissal, according to age and service. The staff thus retired or discharged were to be paid according to age and length of service, either a pension during retirement, or reserve pay, or compensation if discharged.

A retiring pension is given to staff being at least 58 years old and with not less than 10 years' service. It varies from 35 % to 80 % of the salary. Reserve pay is granted to staff having at least 10 years' service who were not 58 years old. It increases from 40 to 80 % of the salary according to the years of service and is paid until the retiring age of the officer is reached or until he is recalled to active service. Finally, the staff with less than 10 years' service receive a payment on discharge varying from 1 to 8 months' pay according to length of service. This order was rigorously applied and a considerable reduction of staff was thereby affected. At the 1 January 1925 the staff had already been reduced to 749 275, consisting of 339 138 staff and 410 135 workmen. The Company has continued to follow up this task : in August 1925 its staff was 727 429 comprising 328 634 staff and 398 795 workmen. Amongst these numbers 35 900 are temporary workers recruited for summer duty when permanent way work is at its heaviest, and 5 300 workshops apprentices are included.

The staff is still higher than before the war : the reduction has none the less effected a saving of 20 % in the cost of personnel.

As to the workmen, 34 % of whom have been discharged, a saving of 32 % has been effected. In the case of the staff 22 % have been discharged, but a saving of only 8 % has resulted therefrom. In addition to the 329 000 staff at work, the Company has to support 230 000 on pension or in reserve, as well as widows or orphans on pension. For

every 1.5 of staff at work the Company has one pensioner. This explains how it is that for the first eleven months' operation there is in addition to the expenditure of 935 millions in staff salaries an expenditure of nearly 356 millions for pensions, that is to say, 38 % of the salaries.

The report notes that during the last few months various quarters, such as the syndicates and associations of workmen, as well as industrial federations, have suggested that part of the cost of pensions imposed by the « Reich » should be met by the « Reich » with greater justice than by the Company : this was the procedure adopted moreover in Austria. An annual expenditure of 400 millions on pension is expected : if the « Reich » accepted half the cost, it would be possible, in view of the saving so made, to improve the salaries of the personnel or to reduce by 8 % the whole of the goods rates, or with greater value to the economic activity of the country to lower certain of them to a greater extent.

Rolling stock position.

At the 1 October 1924 there were 29 645 steam locomotives in stock, 269 being narrow gauge. In August 1925 the Company only owned 28 193 locomotives as a result of the reduction made in the stock.

Before the war, an average of 600 locomotives were taken out of stock each year. This number fell considerably during hostilities, but to make up for it a greater effort has been made since, so that in 1921, 1 849 locomotives, in 1922, 1 585, and in 1923, 1 500 locomotives were condemned. Orders given during the last ten years still further increased the number of engines, so that the stock is 11.1 % greater than pre-war. The Company is endeavouring to reduce the number of types in existence and to standardise spare parts.

The rolling stock at the 1 October 1924 consisted of :

67 550 passenger vehicles of standard gauge;

949 passenger vehicles of narrow gauge;

22 849 luggage brake vans of standard gauge;

175 luggage brake vans of narrow gauge;

700 142 goods wagons of standard gauge;

7 164 goods wagons of narrow gauge.

The numbers represent an increase of 17 % in carriages and 26 % in wagons over pre-war figures. It must be noted that if the total goods carried by the « Reichsbahn » is to-day 7 % less than pre-war, the ton-kilometres has increased by 10 %, and at the same time the time taken by wagons to turn round, which in 1913 was 3.7 days, has now increased to about 4.5 days.

Generally speaking, it can be said that the available rolling stock is more than sufficient to meet traffic requirements, especially in view of the present economic crisis; this applies to locomotives as well as to wagons. The Company would therefore appear to have been well advised in limiting to a strict minimum its orders for locomotives and wagons, especially as on the 1 October 1924 it had still 200 locomotives to receive from outstanding orders.

The application of the Kunze-Knorr compressed air brake to goods wagons has been actively continued. At the present time more than 97 % of the goods wagons have been fitted with the Kunze-Knorr brake, 45 % of them being fully fitted and 55 % being piped only. When all the stock is fitted, by the 1 April 1926 at the latest, the number of brakesmen will be reduced by 30 000, but the saving of staff that will result —

already to a large extent realised — will only be 25 000 owing to the extra work thrown on the station staffs.

Thanks to the continuous brake, the service of goods trains has been greatly improved by increasing the speed from 30 to 40 km. (18 to 25 miles) an hour of these trains on nearly all the main lines, and by increasing the speed of the fast goods trains from 50 to 60 km. (31 to 37 miles) an hour. The time so gained in transit is further increased by the fewer stops that goods trains have to make to allow express trains to pass.

Electrification of railways.

At the 1 January 1925 the total length of track ready for electric traction was 652.9 km. (405.8 miles) made up as follows :

Main Lines :	
Mountain Lines in *Silesia* (Görlitz to Königszelt and branches to Grünthal, Liebau and Halbstadt)	261.3 km. (162 4 miles).
Lines in the lignite region of *Central Germany* (Magdeburg-Bitterfeld-Leipzig-Halle and Wahren-Engelsdorf)	173.1 — (107.6 —).
Bavarian Lines (Mittenwald line and the branch line Griesen-Salzburg-Freilassing and the Königssee)	94.2 — (58.5 —).
Baden Lines (Wiesenthal between Bâle and Zell ; Wehrathal between Säckingen and Schöpfheim)	55.0 — (34.2 —).
Urban and Suburban Lines :	
Berlin Suburban Lines	37.0 — (23.0 —).
Hamburg Suburban Lines (Blankenese-Hamburg-Poppenbüttel) .	32.3 — (20 1 —).
Total. . .	652.9 km. (405.8 miles)

During the year 1925 the following lines were being prepared for electric traction :

a) In Bavaria :	
Munich-Garmisch Partenkirchen and the branch from Tutzing to Kochel.	136.1 km. (84.6 miles).
Munich-Herrsching	38.3 — (23 8 —).
Munich-Ratisbon.	138.1 — (85.8 —).
b) Magdeburg District :	
Magdeburg-Central to Magdeburg-Rothensee (shunting yard).	5.9 — (3 7 —).
c) Berlin Suburban lines	26.2 — (16.3 —).
Total. . .	344.6 km. (214.2 miles).

When the work has been completed, the length of electirified lines will be increased to 997.5 km. (620 miles). At the end of August 1925 the lines electrically operated had a total length of 860.9 km. (534.9 miles).

The prevision for electrification in the 1925 accounts amounts to 20 697 000 mk., and it is estimated that 51 665 000 mk. will have to be spent later on to complete the programme.

For working the electrified lines the « Reichsbahn » had 152 electric locomotives and 250 motor vehicles on the 1 January 1925. There were under construction 175 locomotives and 107 motor vehicles. The Company uses on almost all its lines, monophase current at a frequency of 16 2/3 periods per second at 15 000 volts tension.

State of track and works.

At the end of August 1925 the total length of line operated by the « Reichsbahn » was 53 210 km. (33 064 miles) of which 52 268 km. (32 479 miles) were standard gauge and 942 km. (585 miles) narrow gauge.

The expenditure on upkeep and relaying of these lines had had to be reduced during the last ten years or so; up to 1915, each year about 5 % of the main lines was relayed; since that date 2.8 % only has been done. The Company has decided to fix at 4 % the extent to be relayed each year in future.

The former independent systems of the different German States used different types and arrangements of rails, track and points. The Company has laid down standards, the lines being grouped in three classes, so far as the formation is concerned, and has adopted two types of rail weighing 48.79 kgr. and 45.25 kgr. per metre (98.35 lb. and 91.21 lb. per yard).

An important credit (93.7 million mk. for the twelve months of 1925) has been made for the renewal or repairs to bridges, roofs, station buildings, etc., the upkeep of which obviously has had to be neglected since the war.

As a total, the prevision made for the calendar year 1925 for the upkeep and renewal of the track, works signalling, etc., including the cost of the personnel involved, is 56 % higher than the expenditure made in 1913 for the same purposes.

So far as capital expenditure is concerned, the Company has estimafed it for the whole 1925 period (15 months) at 370 million mk., including on the one hand 35 millions for fitting the Kunze-Knorr brake to rolling stock, and on the other hand 335 millions for construction work of all kinds.

Amongst these works the report notes:

35 millions for strengthening bridges to meet the always increasingly heavy loads to be carried;

23 millions for workmen's dwellings, and out of the remainder, new works, such as the building of new lines, the doubling or quadrupling of tracks, the enlargement or reconstruction of workshops and stations. All these new works from part of a very large construction programme; it is estimated that the expenditure that will have to be made subsequent to the 1 January 1926 to complete it will amount to 1 220 million mk.

[313 : 625 .143.3]

Statistics of rail breakages during the year 1925.

In accordance with the resolution passed at the London Congress (1925) (1), we publish below the information which has been sent in by the adherent administrations on the subject of the breakages of rails which have occurred on their systems during the year 1925.

(1) See *Bulletin of the Railway Congress*, March 1926, p. 240.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ARGENTINE																
Buenos-Ayres Great Southern Railway	It has been impossible to give the figures for the year 1925 in time. We have, however, made arrangements for the present year's returns to be kept.															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Buenos-Ayres and Pacific Railway.		Miles.			Miles.									Miles.		
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	3	1 274	1.463	...	...	...	...	...	...	...	...	...	45	1 274	21.940	From 12 tons, on the lightest rail (60.4 lb.) to 19 tons on the heaviest (72.8 lb.).
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard.)	...	...	...	1	1 590	0.391	...	...	...	...	...	...	10	1 590	3.909	19 tons
Total. . .	3	1 274	1.463	1	1 590	0.391	...	...	...	...	...	...	55	2 864	11.933	...
Number of train-miles : 9 114 259. Total number of fractures : 59.														Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 40.41.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Buenos-Ayres Western Railway.		Miles.			Miles.									Miles.		Tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	25	1 622.496	9.574	18.7
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	3	375.689	4.945	2	375.689	3.308	...	...	...	...	...	...	3	375 689	4.945	18.7
Total . . .	3	375.689	4 945	2	375.689	3 308	...	...	...	...	...	...	28	1 998.185	8 707	...
Number of train-miles : 5 434 978. Total number of fractures : 33.														Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles 37.729		

Fractures of rails occurring during the year 1921.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Central Argentine Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	67	...	36	916	24.42	37 346
Medium rails : of 42.5 kgr. per m. (85 lb. per yard).	...	141	...	3	1 014	1.84	...	1 251	...	2	255	4.87	...	47	...	37 346
Total.	...	...	...	3	...	...	...	...	...	2	...	...	36	...	...	...

Number of train-miles : 10 253 060.
Total number of fractures : 41.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 24.85.

Fractures of rails occurring during the year 1922.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Central Argentine Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	67	...	31	821	23.47	37 346
Medium rails : of 42.5 kgr. per m. (85 lb. per yard).	3	226	8.24	5	865	3.59	1	1 220	0 51	3	411	4.54	3	73	25 42	37 346
Total.	3	...	...	5	...	...	1	...	...	3	...	...	34	...	...	...

Number of train-miles : 10 358 806.
Total number of fractures : 46.
Number of fractures per 10 000 000 train kilometres or 6 250 000 train-miles : 27.59.

Fractures of rails occurring during the year 1923.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Central Argentine Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	8	766	6.49	37 346
Medium rails : of 42.5 kgr. per m. (85 lb. per yard).	2	296	4.2	8	417	11.92	3	1 465	1.27	6	593	6.29	1	95	6.54	37 346
Total.	2	...	...	8	...	...	3	...	...	6	...	...	9	...	...	...

Number of train-miles : 11 041 381.
Total number of fractures : 28.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 15.76.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
Fractures of rails occurring during the year 1924.																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Central Argentine Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard	...	...	...	...	...	...	...	...	...	...	...	...	17	803	13.16	37 346
Medium rails : of 42.5 kgr. per m. (85 lb. per yard.)	4	329	7.56	...	150	...	9	1 545	3.62	2	732	1.70	3	145	12 88	37 346
Total. . .	4	...	...	...	...	...	9	...	...	2	...	...	20	...	...	

Number of train-miles : 12 176 829.
Total number of fractures : 35.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 17.86.

Fractures of rails occurring during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Central Argentine Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	19	703	16.86	37 346
Medium rails : of 42.5 kgr. per m. (85 lb. per yard.)	3	350	5.32	1	53	11.76	2	1 343	0.93	10	1 014	6.13	6	184	20.27	37 345
Total. . .	3	...	...	1	...	...	2	...	...	10	...	...	25	...	...	...

Number of train miles : 12 063 315
Total number of fractures : 41
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 21.12.

Cordoba Central Railway.

We regret we are unable to supply the information required, as no records of rail breakages on the Company's system have been kept.

BELGIUM.

State Railways.

It will not be possible to furnish a return of broken rails compiled in the way requested, so far as the year 1925 is concerned.

The time required by the Statistical Service is such that this year it will not be possible to meet the requirements as specified at the London Congress : the necessary arrangements have been made so as to be able to do so after this year.

Chimay Railway.

On this line no rails broke during 1925.

Malines-Terneuzen Railway.

Nil.

French Northern Railway.

Nord Belge Lines.

1	2	3 Miles.	4	5	6 Miles.	7	8	9 Miles.	10	11	12 Miles.	13	14	15 Miles.	16	17 English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	3.991	...	...	0.210	...	...	4.249	...	22	30.181	453	18 20
Medium rails : of 42.5 kgr. to 52.5 kgr. per m. (85 to 105 lb. per yard).	1	29.633	21	...	0.573	...	...	51.893	...	1	48.910	13	2	29.551	42	19.68
Heavy rails : of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	...	...	...	...	...	...	...	1.241	...	...	0.150	...	...	0.030	...	19.68
Total, . .	1	29.633	21	...	4.564	...	...	53.314	...	1	53.309	13	24	59.762	250	...

Number of train-miles : 1 934 649.
Total number of fractures : 26.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 84.

For particulars of the fractures see overleaf.

PARTICULARS OF THE FRACTURES :

LIGHT RAILS OF MORE THAN 20 YEARS OF AGE:

6 failures at the fishplates; breakages with old fracture much rusted extending to the outside surface of the head; number of pieces for each breakage: 2.

2 failures at the joint; fractures shewing old fracture much rusted not reaching to the outside surface of the head; number of pieces for each failure: 2.

1 failure at the joint; breakage clean and new over the whole of the head without oval silvery mark; number of pieces: 2.

2 failures outside the joint; fractures shewing surface much rusted reaching to the outside surface of the foot and of the head; number of pieces for each failure: 2.

5 failures outside the joint; breakages shewing much rusted surface reaching to the exterior surface of the head; number of pieces for each failure: 2.

1 failures outside the joint; old fractures very much rusted reaching to the outside surface of the foot; number of pieces for each failure: 2.

1 failure outside the joint; clean and new breakages over the whole section without oval silvery mark; number of pieces: 3.

2 fractures outside the joint; clean and fresh breakages over the whole of the section of the rail without oval silvery mark; number of pieces for each failure: 2.

RAILS OF MEDIUM WEIGHT.

Rails less than 5 years of age.

1 failure outside the joint; breakage with part of the fracture slightly rusted reaching to the exterior surface of the foot; number of pieces: 2.

Rails from 15 to 20 years.

1 failure at the joint; breakage shewing part of the fracture much rusted reaching to the exterior surface of the head; number of pieces: 2.

Rails more than 20 years of age.

1 failure at the joint; new and clean breakage over the whole section without oval silvery mark; number of pieces: 2.

1 failure outside the joint; part of the fracture much rusted reaching to the exterior surface of the foot; number of pieces: 2.

2

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years.			5 to 10 years.			10 to 15 years.			15 to 20 years.			More than 20 years.			Maximum axle load
	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
National Light Railways.	Up to the present a proper record of all rails broken on our lines has not been kept. Instructions have been issued to collect the necessary particulars in future in order that you may be given the information regularly.															

Fractures of rails occurring during the year 1925 (11 months).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
BRAZIL. Brazilian Eastern Railways.														Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	158	245	400	9.84

Number of train-miles : 1 241 940.
Total number of fractures : 158.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 790.

This information is with regard to the first eleven months of 1925. The Company, whose Head Office is at Paris, hopes to complete them on receipt of further information from Brazil.

CHILE. Nitrate Railways. — We have no data regarding the subject « Breaking of rails » and we regret therefore that we are unable to complete the form sent us.

Fractures of rails occurring during the year 1921.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CHINA. Lunghai Railway Pienlo Railway (Lunghai Section).											Miles.					Tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	1	115	5.4	...	...	...	17.72

Number of train-miles : 325 434.
Total number of fractures : 1.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 20.

A. — Percentage of breakages in the portion of the rail covered by the fishplates : 100 %.

B. — Percentage of fractures according to the appearance of the fracture :

a) Fresh and clean fracture through the whole of the rail section : Nil.

b) Fractures, part of which are old and much rusted, extending to the outer face of the head of the rail : 100 %.

c) Fractures with much rusted portions not extending to the outer face of the head of the rail : Nil.

d) Number of pieces into which the rail is broken : 3.

Fractures of rails occurring during the year 1922.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
											Miles.					Tons.
Pienlo Railway (Lunghai Section).																
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	1	115	5.4	...	...	...	17.72

Number of train-miles : 312 104
Total number of fractures : 1

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 20

A. — Percentage of breakages in the portion of the rail clear of the fishplates : 100 %.

B. — Percentage of fractures according to the appearance of the fracture :

a) Fresh and clean fracture through the whole of the rail section : Nil.
b) Fractures, part of which are old and much rusted, extending to the outer face of the head of the rail : 100 %.
c) Fractures with much rusted portions not extending to the outer face of the head of he rail : Nil.
d) Number of pieces into which the rail is broken : 2.

From 1923 to 1925 the Pienlo Section had no fractured rails. No fracture of rails occurred on the Lunghai Line itself.

Fractures of rails occurring during the year 1924 (1 April to 31 March 1925).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
South Manchuria Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	3	35.9	52	37	110.5	208	134	377.7	221	9	57.7	96	43 695
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	16	411.5	24	...	...	...	...	...	...	...	...	...	...	...	...	49 050
Total. . .	16	411.5	24	3	35.9	52	37	110.5	208	134	377.7	221	9	57.7	96	...

Number of train-miles : 8 063 302.
Total number of fractures : 199.
Above figures apply only to main lines not including sidings.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 153.

Fractures of rails occurring during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DENMARK. State Railways.		Miles.			Miles.			Miles.			Miles.			Miles.		
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	16.93	...	8	149.87	33.3	2	301.00	4.1	2	169.05	7.4	73	779.11	58.2	(a) (b) (c)
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	...	98.56	...	...	76.24	...	...	64.23	...	1	160.50	3.9	3	37.16	50.9	(d)
Total. . .	...	115.49	...	8	226.11	22.0	2	365.23	3.4	3	329.55	5.7	76	816.27	57.9	...

Number of train-miles : 10 774 460.
Total number of fractures : 89.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 51.3.

(a) 24 250 lb. (45.35 lb. per yard); (b) 28 660 lb. (64.50 lb. per yard); (c) 33 070 lb. (74.59 lb. per yard); (d) 33 070 lb. (90.70 lb. per yard).

For particulars of the fractures see overleaf.

DESCRIPTION OF RAILS.	Total number of breakages.	A				B						
		Percentage of breakages				Percentage of breakages according to the appearance of the section.						
		At the joint.		Outside the joint.		*a*) 1 and 2 New fractures.		*b*) 1 and 2 + *c*) Old fractures.		*d*) Number of pieces rails broken into		
		Number.	Percentage.	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.	two pieces.	three pieces.	four pieces.
Light rails.	85	48	56.5	37	43.5	49	57.7	36	42.3	73	10	2
Medium rails.	4	4	100	...	...	...	...	4	100	4	...	...

A. — Percentage of breakages in the respective portions of the rails covered by and clear of the fishplates.

B. — Percentage of fractures according to the appearance of the fracture.

a) Fresh and clean fracture through the whole of the rail section:

1° With silvery oval mark;
2° Without silvery oval mark;

b) Fractures, part of which are old and much rusted, extending to the outer face of the foot or head of the rail:

1° When the rusted part is in the foot;
2° When the rusted part is in the head.

c) Fractures with much rusted portions not extending to the outer face of the foot or head of the rail.

d) Number of pieces into which the rail is broken.

The tables include failures of rails on running lines and on the main lines in the stations excluding sidings and holding sidings. So far as classification of broken rails is concerned the indications given are not in accordance with the wishes of the Congress because the failures that occurred during the year 1925 have not been kept in such a way that the information asked for can be given. This will be done, however, in future years.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Aalborg Privatbaner.	During 1925 there was no case of broken rail on our system.															
SPAIN Madrid to Cáceres and Portugal and West of Spain Railway.	It has not been our practice to classify broken rails on the lines indicated, so that we are unable to give you the information asked for so far as 1925 is concerned; we propose, however, to do so in future, and shall be pleased to send you the results.															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Madrid, Saragossa and Alicante Railway (former System).														Miles.		Pounds
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	38	333.5	70.80	33 070

Number of train miles : 1 172 380.
Total number of fractures : 38.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 201.41.

A. — Percentage of failures at the joint (that is to say in the part of the rail covered by the fishplate) and outside the joint:
At the joint: 0 %; outside the joint: 100 %.

B. — Percentage of failures according to the appearance of the section:
a) New clean break over the whole section of the rail:
1. With oval silvery mark: 2.63 %;
2. Without oval silvery mark: 44.74 %.
b) Fracture partly old and rusted extending to the outside surface of the flange or head of the rail:
1. Rusted surface in the flange of the rail: 47.37 %;
2. Rusted surface in the head of the rail: 5.26 %.
c) Break with old and rusted surface not extending to the exterior surface of the flange or of the head of the rail: 0 %.
d) Number of pieces into which the rail was broken on the total number of 38 failures: 37 into two parts and 1 into 5.

It should be noted that the number of train-miles given in the table refers only to those lines on which failures occurred, the length in miles of which are given on the same table.
The mileage of the former system of this Company was 1 942.8 and the number of train-miles was 12 327 099.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Medina del Campo to Zamora and Orense to Vigo Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	12	130	57.41	33 070
Northern of Spain Railway.																
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	2	1 450	0.85	1	1 450	0.42	78	1 450	33.43	35 000
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	6	1 265	2.95	3	1 265	1.47	3	1 265	1.47	5	1 265	2.45	2	1 265	0.98	35 000
Heavy rails: of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	We have no rails of such section.															
Total. . .	6	...	...	3	...	...	5	...	...	6	...	...	80	...	...	...

Number of train-miles : 17 788 005.
Total number of fractures ; 100.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles ; 35.

Mines and Railway of Utrillas.

No fracture of rails occurred on our system during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Great Southern of Spain Railway.														Miles.		Pounds
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	7	123	35	30 644

Number of train-miles : 350 648.

Total number of fractures : 7.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 124.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
UNITED STATES OF AMERICA. Central of Georgia Railway.		Miles.			Miles.									Miles.		Pounds
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	7	12.12	361	55 000
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	52	356.15	91	61	242.82	157	...	...	...	...	...	...	...	...	...	61 700
Total. . . .	52	356.15	91	61	242 82	157	...	...	...	...	...	...	7	12.12	361	...

Number of train-miles : 5 220 162.

Total number of fractures : 120.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 144.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Delaware and Hudson Railway.		Miles.			Miles.									Miles.		Pounds
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	401	330	750	265	340	487	...	...	...	...	...	...	103	120	531	± 75 000

Number of train-miles : ± 6 000 000.
Total number of fractures : 769.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 801.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Delaware, Lackawanna and Western Railroad		Miles.			Miles.									Miles.		Pounds
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	43.24	...	5	72.80	43	...	...	...	...	...	...	2	120.15	11	68 400
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard.)	107	342.93	190	60	276.24	137	...	...	...	...	...	...	...	...	...	...
Heavy rails :																
of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	9	101.57	55	...	...	...	...	...	...	...	...	...	...	...	...	68 400
Total. . .	116	487.74	149	65	349.04	116	...	...	...	...	...	...	2	120.15	10	...

Number of train-miles : 10 660 000.
Total number of fractures : 183.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 108.

Fractures of rails occurring during the year ending 1 November 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Illinois Central Railroad.		Miles.			Miles.			Miles.			Miles			Miles.		Pounds
Medium rails : 45 kgr. per m. (90 lb. per yard)).	728	3 356	135	997	2 199	283	421	925	284	...	...	...	...	...	...	63 700

Number of train-miles : 299 364 200.
Total number of fractures : 2 146.

Number of fractures per 6 250 000 train-miles : 45.

Percentage of breakages covered by fishplates : 14.9.
— — clear of fishplates : 85.1.
— — with silvery oval mark : 20.1.
— — without silvery oval mark : 79.9.

Your letter concerning number of rail failures in relation to the number of train-miles, asks for data in a form which has never been followed by the railroads of this country. It has, therefore, taken considerable time to compile the information.

Some years ago we discontinued keeping rail failure statistics in connection with our 85 lb. rail, and the 110-lb. rail in use on the Illinois Central has not been in service a sufficient length of time to be of value in this report. The figures shown in the table are for the year ended 1 November, 1925, and cover our 90 lb. rail only.

Fractures of rails occurring during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Kansas City Southern Railway.		Miles.			Miles.									Miles.		Pounds
Medium rails : of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	1	37	17	23	128	113	...	...	...	...	...	...	91 (1)	15	3 790	69 410

Number of train-miles : 751 806 (2).
Total number of fractures : 115.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 956.

(1) 54 of these rails were 1905, sawed and relayed. — (2) Passenger, freight and work train-miles.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Lehigh & New England Railroad.		Miles.			Miles.											
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	2	23	54	25	33	466	...	...	...	...	...	...	...	...	...	...

Fractures of rails occurring during the year 1 November 1924 to 31 October 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Lehigh Valley Railroad.		Miles.			Miles.			Miles.								Pounds
Rails of 49.60 kgr. per m. (100 lb. per yard).	...	...	...	1	81.90	7.63	6	214.93	17.45	...	...	...	...	...	...	68 330
Rails of 54.57 kgr. per m. (110 lb. per yard).	...	...	...	...	...	...	3	39 14	47.90	...	...	...	...	...	...	68 330
Rails of 67.45 kgr. per m. (136 lb. per yard).	2	438.31	2.85	10	213.94	29.21	...	...	...	...	...	...	...	...	...	68 330
Total . .	2	438.31	2.85	11	295.84	23.1	9	254.07	22.01	...	...	...	...	...	...	...

Number of train-miles : no information available.

Total number of fractures : 22.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : no information available.

Fractures of rails occurring during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Long Island Railroad.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails: of a weight less than 42.5 kgr. per m. (85 lb. per yard).	...	...	...	...	10	...	4	5	500	12	50	150	46	413	67	60 000
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	1	190	3	4	65	38	17	40	265	24	90	265	18	85	132	60 000
Heavy rails: of 53 kgr. per m. (106 lb. per yard) or more.	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	60 000
Total. . .	1	191	3	4	75	38	21	45	765	36	140	415	64	498	199	...

Number of train-miles : 7 905 598.
Total number of fractures : 126.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 100.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Norfolk & Western Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails: of 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	15	402	23.3	55	175	19.3	18	25	450.0	65 000
Medium rails: of 49.60 kgr. per m. (100 lb. per yard).	14	300	29.2	47	554	53.0	65	550	73.8	...	...	...	...	...	...	65 000
Heavy rails: of 64.50 kgr. per m. or 130 lb. per yard.	88	572	96.2	...	...	...	...	...	...	...	...	...	...	...	...	65 000
Total. . .	102	872	74.5	47	554	53.0	80	952	52.6	55	175	19.3	18	25	450.0	...

Number of train-miles : 15 818 965.
Total number of fractures : 302.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 120.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Pennsylvania Railroad.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	93	246.79	234.2	384	611.87	390.0	871	1 513.32	357.6	66 140
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	196	849.10	143.4	1 126	1 354.15	516.7	2 918	2 650.55	684.1	1 269	1 542.05	511.4	1 652	2 446.58	419.6	73 200
Heavy rails :																
of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	739	2 349.43	195.5	1 355	1 496.92	562.5	37	130.58	176.1	...	0.85	...	...	...	...	73 200
Total. . . .	935	3 198.53	181.6	2 481	2 851.07	540.7	3 048	3 027.92	625.5	1 653	2 154.77	476.7	2 523	3 959.90	395.9	...

Number of train-miles : 119 291 927.
Total number of fractures : 10 640.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 554.2.

* Broken in 2 pieces : 8 131 (99 22 %); 3 pieces : 44 (0.54 %); 4 pieces : 12 (0.15 %); 5 pieces : 3 (0.04 %); 6 pieces : 4 (0.05 %).

* These figures include only Eastern and Central Regions, data for Western Region not available.

Fractures in joint : 7 544 = 70.90 %.
Fractures not in joint : 3 096 = 29.10 %.

Fractures with silvery oval mark : 817 = 7.68 %.
Fractures without silvery oval mark : 9 823 = 92.32 %.

Reading Company.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	..	...	7	...	...	...
Medium rails : of 42.5 to 52.5 kgr. per m (85 to 105 lb. per yard.)	16	...	...	82	...	...	45	...	...	23	...	...	21	...	...	...
Heavy rails : of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total. . .	57	...	...	82	...	...	45	...	...	23	...	...	28	...	...	...

Light rails less than 85 lb. per yard, 20 or more years service. Failures from straight breaks : 7.

Rails from 85 to 105 lb. per yard. Total number of failures : 16 broken rails (three of which were transverse fissures, showing black marks in the head).

5 to 10 years service : 82 broken rails, 43 of which were straight breaks and 39 transverse fissures. (All transverse fissures showing black marks.)

10 to 15 years service : 45 broken rails, 26 of which were straight breaks and 9 transverse fissures.

15 to 20 years service : 23 broken rails, 14 of which were straight breaks and 9 transverse fissures.

More than 20 years service : 21 broken rails. No transverse fissures.

Rails from 106 to 130 lb. or more. Less than 5 years service : 41 broken rails, 14 of which were straight breaks and 27 transverse fissures.

We have no record of broken rails of these weights which have been in the track more than 5 years.

Richmond, Fredericksburg & Potomac Railroad.	2	3 Miles.	4	5	6 Miles.	7	8	9	10	11	12	13	14	15	16	17 Pounds
Medium rails : of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard.)	2	200	60	3	20	93	...	...	...	...	...	...	...	...	...	67 000

Number of train-miles : 2 794 736.
Total number of fractures : 5.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 11.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Wabash Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	3	0.3	6 249	48	218.20	137	44	214.8	128	935	68.53	8 527	66 500
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	17	867.57	13	50	225.3	138	148	233.80	395	...	...	...	...	...	...	66 500
Total. . .	17	867.57	13	53	225.6	6 387	196	452.00	532	44	214.8	128	935	68.53	8 527	...

Number of train-miles : 14 634 884.
Total number of fractures : 1 245.
Number of fractures per 6 250 000 train-miles : 532.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
FINLAND State Railways.		Miles.			Miles.			Miles.			Miles.			Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	6	70	...	1	301	...	1	315	...	8	315	...	112	2 455	...	14.76
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	...	143	...	...	59	...	...	14	...	...	...	...	...	...	...	...
Total. . .	6	213	...	1	360	...	1	329	...	8	315	...	112	2 455	...	...

Number of train-miles : 11 181 155.
Total number of fractures : 128.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 71.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS.	Age of rails : Less than 5 years.	5 to 10 years.	10 to 15 years.	15 to 20 years.	More than 20 years.	Length of single track.	Number of fractures per 1000 km. or per 625 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9
FRANCE.						Miles.		English tons.
State Railways.								
Light rails :								
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	2	...	11	32	256	5 996	31	19.7
Medium rails :								
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	7	3	13	1	130	2 051	46	19 7
Heavy rails :								
Standard 55 kgr. per m. (110.87 lb. per yard).	...	...	...	...	...	17	...	19.7
Total . . .	9	3	24	33	386	...	...	...

Number of train-miles : 41 770 241.
Total number of fractures : 455.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 68.

Percentage of breakages in the respective portions of the rails :

Light rails : *a*) covered by the fishplates : 32 %. — *b*) clear of the fishplates : 68 %.
Medium rails : *a*) covered by the fishplates : 71 %. — *b*) clear of the fishplates : 29 %.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years.			5 to 10 years.			10 to 15 years.			15 to 20 years.			More than 20 years.			*Maximum axle load.*
	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Alsace and Lorraine Railways.		Miles.			Miles.			Miles.			Miles.			Miles.		
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	102	...	5	174	18	16	138	72	83	1 181	44	For wagons 15.7 English tons.
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	3	294	7	4	37	68	6	103	36	15	240	39	...	...	...	For locomotives 18.3 English tons.
Total. . .	3	294	7	4	139	18	11	277	25	31	378	51	83	1 181	44	...

Number of train-miles : 18 843 053.
Total number of fractures : 132.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 44.

The above table shews all fractures reported during the year 1925 on the Alsace and Lorraine system including the Guillaume-Luxembourg lines.

Fractures of rails in 1925 (excluding those in points and crossings).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Paris Circle Railways.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	0 249	...	...	1.678	...	...	12.117	...	4	11.185	222	16	40 169	247	
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	2	40.390	31	...	7.767	...	8	9.321	533	3	1.553	1 200	10	1.676	3 708	42 330
Heavy rails: of a weight equal to or greater than 54 kgr. p' m. or 106 lb. p. y'.	...	2.212	...	...	...	...	...	...	...	...	...	...	...	...	...	
Total. . .	2	42.851	29	...	9.445	...	8	21.438	232	7	12.738	341	26	41.845	386	...

Number of train-miles : 1 651 749.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 162.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS.	Age of rails : Less than 5 years.	5 to 10 years.	10 to 15 years.	15 to 20 years.	More than 20 years.	Length of single track.	Number of fractures per 100 km. or 62.5 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9
Eastern Railway.						Miles.		English tons.
Light rails : < 40 kgr. (80.63 lb. per yard).	...	2	...	5	374	188	7.43	18.3
Medium rails : ⩾ 40 kgr. (80.63 lb. per yard).	3	23	47	39	188	2 606	7.15	18.3
Heavy rails : 55 kgr. (110.87 lb. per yard).	...	...	...	...	...	9	...	18.3
Total. . .	3	25	47	44	562	...	...	...

Number of train-miles : 35 478 691.
Total number of fractures : 681.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 119.6.

Percentage of fractures in the respective portions of the rails :

Light rails : *a*) Covered by the fishplates : 25.72 %.
b) Clear of the fishplates : 74.28 %.

Medium rails : *a*) Covered by the fishplates : 80.33 %.
b) Clear of the fishplates : 19.67 %.

The information asked for cannot be sent you either in the form or in the detail laid down at the London Congress except for the year 1926, as the necessary details are not available for 1925.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Midi Railway.		Miles.			Miles.			Miles.						Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	115	2 558	28	17.7
Medium rails : of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	...	495	...	4	334	7	1	37	16	...	...	...	...	...	...	17.7
Total. . .	...	495	...	4	334	7	1	37	16	...	...	...	115	2 558	28	...

Number of train-miles : 19 835 659.
Total number of fractures : 120.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 38.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Northern Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	3	343	5.4	1	32.62	19	...	30.76	...	184	900	127	18.5
Medium rails : of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	3	422.54	4.4	...	554	...	8	428.75	11.6	19	352 95	33.4	114	783	90	18.5
Heavy rails : of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	...	1.74	...	...	...	...	...	0.05	...	...	...	...	...	...	...	18.5
Total. . .	3	424.28	4.4	3	897	2	9	461.42	12.1	19	383.71	30.8	298	1 683	110	...

Number of train-miles : 35 714 881.
Total number of fractures : 332.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 58.

We are unable to give detailed figures as required, but have arranged for this additional information to be given as from next year.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS.	Number of fractures.	Length of single track of this class.	Number of fractures per 1000 km. or per 625 miles	*Maximum axle load.*
		Miles.		English tons.
Orleans Railway.				
Light rails ;				
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	142	4 688	18	17.912
Medium rails :				
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard.	247	1 960	78	17.912
Heavy rails :				
of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	...	35	...	17.912
Total. . .	389	6 683	36	...

Number of train-miles : 39 421 121.
Total number of fractures : 389.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 61.

We have only been able to supply totals, as our statistical information does not indicate the lengths of single track of each type of rail grouped by their ages.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS.	Age of rails: Less than 5 years. Number of fractures.	5 to 10 years. Number of fractures.	10 to 15 years. Number of fractures.	15 to 20 years. Number of fractures.	More than 20 years. Number of fractures.	TOTALS.	*Approximate* length of single track of this class at 1 January 1925.	Number of fractures per 1 000 kilometres or per 625 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9	10
							Miles.		English tons.
Paris, Lyons and Mediterranean Railway.									
Light rails: of a weight less than 42 5 kgr. per m. or 85 lb. per yard. PM, PLM-A, PM-A; Standard C; American DSE.	6	7	10	13	439	475	4 816	61.29	18.2
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard). PM-G, LP, Standard B.	21	60	58	69	209	417	4 600	55.60	18.2
Heavy rails: of a weight equal to or greater than 52.5 kgr. per m. or 105.82 lb. per yard. Standard A.	...	...	...	...	...	...	5	...	18.2
Total . . .	27	67	68	82	648	892	9 481	...	...

Number of train-miles : 67 717 952.
Total number of fractures : 892.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 81.85.

Percentage of failures:

Light rails: At the joint: 24.63. — Outside the joint: 75.37.
Medium rails: At the joint: 77.93. — Outside the joint: 22.07.

Number and percentage of new and clean fractures (over the whole section):					Number and percentage of old fractures:				
Light rails:	426	93.83 %	*Medium rails:*	341	85.46 %	*Light rails:*	28	6.17 %	*Medium rails:*	58	14.54 %

Number of pieces rails broken into:

	2 pieces	3 pieces	4 pieces	5 pieces	7 pieces	8 and + pieces
Light rails:	424	36	11	4	...	...
Medium rails:	353	48	14	...	2	...

The information supplied is tentative:

Our statistics as now kept do not enable us to arrive at the length of track in accordance with its age and type of rail, as required by the form you sent us and consequently neither does it for each of these types of rail give the number of breakages reported per 1 000 km. (625 miles) of single line.

We are preparing this summary and will send it to you as soon as it is ready.

In the same way we have not so far grouped breakages in accordance with the defects in the metal shewn by the appearance of the fracture. The only information that we could give approximately would be the number of rails broken with new fractures of the whole section, and those with old fractures either of the whole section or part of it.

Cambrésis Railway.

Fractures of rails occurring on our System during the year 1925:

1. — *Cambrai to Catillon line* (21.791 miles).
13 fractures of 26 ft. 3 in. rails, 36.29 lb. per yard.

2. — *Denain to Catelet line* (32.564 miles).
6 fractures of 26 ft. 3 in. rails, weighing 40.32 lb. per yard.
1 fracture of 13 ft. 9 3/8 in. rail, weighing 36.29 lb. per yard.
14 fractures of 26 ft. 3 in. rails, weighing 36.29 lb. per yard.
1 fracture of 26 ft. 3 in. rail, weighing 40.32 lb. per yard.
1 fracture of 39 ft. 4 1/2 in. rail, weighing 40.32 lb. per yard.
1 fracture of 26 ft. 5/8 in. rail, weighing 36.29 lb. per yard.

The breakages are to be ascribed to the serious wear of the 18 kgr. (36.29 lb. per yard) rails which were put into service over 30 years ago.

So far as those of 20 kgr. (40.32 lb. per yard) are concerned, the breakage is also due to worn and out of shape rails, most of which were blown up by the enemy.

Chauny-St-Gobain Railway.

This line has been rebuilt since the War with material of good quality, and so far no case of broken rails has occurred since the working of the line was resumed.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Bouches-du-Rhône Departmental Railways and Electric Tramways.																
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	9	124.493	44.90	19.7

Number of train-miles : 249 858.
Total number of fractures : 9.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 223.75.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Tarn Departmental Railways.																
Light rails :														Rails 10 to 20 years old.		
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	...	93	...	7.9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Eastern of Lyons Railway.														Miles.		English tons.
Light rails :																
of a weight of 30 kgr. per m. (60.47 lb. per yard).	...	...	...	...	...	...	...	...	...	...	...	...	59	65	567	14.8

Number of train-miles : 280 472.
Total number of fractures : 59.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 1 307.

The relatively high number of broken rails on our system is due to the rails having been in use since the line was opened over 40 years ago, and to their relatively light weight for the work expected of them.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Somain-Anzin-Frontière belge Railway.														Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	2	29.76	41.7	16.239

Number of train-miles : 337 030.
Total number of fractures : 2.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 36.87.

Provence Railways.

The question of broken rails hardly affects this system, as broken rails are almost unknown.

Uniteed Transport Company for Paris and district.

We are unable to give any information as no statistics of broken rails are kept in view of the fact that this matter has much less interest for us than for other Railway Companies. Our system actually is almost entirely a tramway system with rails laid in the roadway, the running speeds being low and in consequence broken rails rarely occur, and, even when they do, there is little danger.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ALGIERS AND TUNIS.		Miles.			Miles.									Miles.		English tons.
Algerian State Railways. **Algiers** District.																
Light rails:																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	16	...	...	...	...	...	...	...	...	...	...	12	617	12	13.78
Medium rails:																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	...	8	...	...	173	...	...	...	...	...	...	...	...	...	...	13.78
Total. . .	...	24	...	...	173	...	...	...	...	...	...	...	12	617	12	...

Number of train-miles : 2 443 391.
Total number of fractures : 12.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 30.52.

A. — Percentage of breakages in the respective portions of the rails :

1. Covered by the fishplates . . . . . 8.33 %
2. Clear of the fishplates . . . . . 91 67 %

B. — Fractures according to the appearance of the fracture :

a) Fresh and clean fracture through the whole of the rail section :

1. With silvery oval mark : . . . . . 8.34 %
2. Without silvery oval mark : . . . . . 25 %

b) Fractures, part of which are old and much rusted, extending to the outer face of the foot or head of the rail :

1. When the rusted part is in the foot : . . . . . 16.66 %
2. When the rusted part is in the head : . . . . . 33.34 %

c) Fractures with much rusted portions not extending to the outer face of the foot or head of the rail : . . . . 16.66 %

d) Number of pieces into which the rail is broken : . . . . 3 and 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Bône District.		Miles.			Miles.									Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	12	192.256	39	13.78
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard.)	...	50.705	...	...	32 250	...	...	...	...	...	...	...	...	...	...	15.25
Total. . .	...	50 705	...	...	32.250	...	...	...	...	...	...	...	12	192.256	39	...

Number of train-miles : 1 425 590.
Total number of fractures : 12.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 52.03.

A. — Percentage of breakages in the respective portions of the rails :

1. Covered by the fishplates . . . . . 25 %
2. Clear of the fishplates. . . . . 75 %

B. — Fractures according to the appearance of the fracture :

a) Fresh and clean fracture through the whole of the rail section :

1. With silvery oval mark . . . . . 8.34 %
2. With ut silvery oval mark . . . . . 41.67 %

b) Fractures, part of which are old and much rusted, extending to the outer face of the foot or head of the rail :

1. When the rusted part is in the foot. . . . . 16 66 %
2. When the rusted part is in the head . . . . . 16.67 %

.) Fractures with much rusted portions not extending to the outer face of the foot or head of the rail . . . . 16.66 %

d) Number of pieces into which the rail is broken . . . . 4 and 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Oran District.		Miles.			Miles.									Miles.		
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	1	89	7	...	48	...	...	...	...	...	...	...	13	627	13	...

Number of train-miles : 1 578 528.
Total number of fractures : 14.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 55.11.

A. — Percentage of breakages in the respective portions of the rails:

1. Covered by the fishplates . . . . . 100 %
2. Clear of the fishplates. . . . .

B. — Fractures according to the appearance of the fracture :

a) Fresh and clean fracture through the whole of the rail section :

1. With silvery oval mark . . . . . 25 %
2. Without silvery oval mark . . . . . 25 %

b) Fractures, part of which are old and much rusted, extending to the outer face of the foot or head of the rail:

1. When the rusted part is in the foot. . . . . 21.4 %
2. When the rusted part is in the head . . . . . 28.5 %

c) Fractures with much rusted portions not extending to the outer face of the foot or head of the rail . . . .

d) Number of pieces into which the rail is broken. . . . 2

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Paris, Lyons and Mediterranean Railways (Algerian system).		Miles.			Miles.									Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	1	121	5.67	6	101	37.03	...	...	...	...	...	...	20	569	21.94	16.387
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard),	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16.387
Heavy rails: of a weight equal to or greater than 53 kgr. per m. or 106 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16.387
Total . . .	1	121	5.67	6	101	37.03	...	...	...	...	...	...	20	569	21.94	...

Number of train-miles : 1 891 930.
Total number of fractures : 27.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 68.44.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Gafsa Railway.														Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	3	151	13	9.8

Number of train-miles : 676 741.
The number of train-miles since the line was open 27 years ago, is 14 602 487.
Total number of fractures : 3.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 30.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Tunisian Railways.		Miles			Miles.			Miles.			Miles.			Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.																
20 kgr. (40.32 lb. per yard) (narrow gauge)	...	107.94	...	...	107.94	...	...	107.94	...	...	107.94	...	1	107 94	5.75	11.8
25 kgr. (50.40 lb. per yard) (normal gauge)	1	28.81	21.56	1	28.81	21.56	2	28.81	43.12	3	28.81	64.70	10	28.81	215.60	14.8
25 kgr. (50.40 lb. per yard) (narrow gauge)	...	401.90	...	...	401.90	...	4	401.90	6.18	7	401.90	10.81	8	401.90	12.36	11.8
30 kgr. (60.48 lb. per yard) (normal gauge)	...	145.25	...	...	145.25	...	...	145.25	...	...	145.25	...	...	145.25	...	14.8
30 kgr. (60.48 lb. per yard) (narrow gauge)	...	158.50	...	...	158.50	...	...	158.50	...	...	158.50	...	...	158.50	...	11.8
34 kgr. (68.54 lb. per yard) (normal gauge)	...	24.10	...	...	24.10	...	...	24.10	...	1	24.10	25.78	8	24.10	206.24	14.8
38.20 kgr. (77.01 lb. per yard) (normal gauge)	...	117.00	...	...	117.00	...	...	117.00	...	...	117.00	...	...	117.00	...	14.8
Total . . .	1	983.50	0.63	1	983.50	0 63	6	983.50	3.79	11	983.50	6.95	27	983.50	17.06	...

Number of train-miles : 3 054 901.
Total number of fractures : 46.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 93.57.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
COLONIES & PROTECTORATES. — **AFRICA.** **French West African Railways.**					Miles.									Miles.		English tons.
***a*) Thies to the Niger.**																
Light rails :																
26 kgr. per m. (52.41 lb. per yard).	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11 8
25 kgr. per m. (50.40 lb. per yard).	...	...	...	2	429	3	...	...	...	...	...	...	...	...	...	11.8
20 kgr. per m. (40.32 lb. per yard).	...	...	...	...	...	...	...	...	...	...	...	...	1	348	2	9.8
Total. . .	...	...	...	2	429	3	...	...	...	...	...	...	1	348	2	...

Number of train-miles : 884 409.
Total number of fractures : 3.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 21.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
***b*) Conakry to the Niger Railway.**											Miles.					English tons.
Light rails :																
25 kgr. per m. (50.40 lb. per yard).	...	...	...	...	...	...	...	...	...	3	75	25	...	...	...	9 8

Number of train-miles : 377 162.
Total number of fractures : 3.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 49.4.

1	2	3	4	5	6	7	More than 10 years. 8	9	10	11	12	13	14	15	16	17
c) Ivory Coast Railway.		Miles.			Miles.			Miles.									
Light rails :																
Vignoles, 6 metres (19 ft. 8 1/4 in.) long : Kilometre 0 to 294	...	...	...	...	...	...	...	183	...	...	...	...	...	...	.	...
Vignoles, 8 metres (26 ft. 3 in.) long : Kilometre 294 to 346.60. . .	...	...	...	...	19.88	...	...	12	...	...	...	...	...	...	...	...
Vignoles, 10 metres (32 ft. 9 5/16 in.) long : Kilometre 346.60 to 349.50. .	...	...	...	...	1.80	...	...	...	...	...	...	...	...	...	...	...
Standard, 8 metres (26 ft. 3 in.) long : Kilometre 349.50 to 369.90. .	...	12.68	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Standard, 12 metres (39 ft. 4 1/2 in.) long : Kilometre 369.90 to 452. . .	...	51.02	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Weight per metre (per yard) : Vignoles 25.50 kgr. (51.40 lb.) Standard 26.10 kgr. (52.60 lb.)																
Total. . .	...	63.70	...	...	21.68	...	...	195	...	...	...	...	...	...	...	...

Number of train-miles : 323 563.
Total number of fractures : nil.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : nil.

d) East Dahomey Railway.

No fractured rail was reported during the year 1925.

French Dahomey Railway Company.

22 kgr. per metre (44.35 lb. per yard). — No breakage was reported in 1925, nor during the preceding years. The last year in which rails were laid was 1910, the oldest rails in use having been laid in 1902.

For 1925 : number of train-miles : 89 492.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ASIA MINOR.														Miles.		English tons.
Damas-Hamah and Extensions Railway.																
Light rails:								Rails of 30 kgr. (60.48 lb. per yard).								
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...		— Branch Line.					2	0.930	...	12.480
Number of train-miles : 7 130.8.								Total number of fractures : 2.								

The first failure occurred with a rail of 30 kgr. (60.48 lb. per yard) measuring 9.45 m. (31 feet) in length; it occurred at 1.65 m. (5 ft. 5 in.) from the joint and was ascribed to a defect in rolling.

The second failure occurred with a rail of the same kind measuring 9.55 m. (31 ft. 4 in.) in length and took place at 1.35 m. (4 ft. 5 1/8 in.) from the joint through an old flaw in the rail bottom.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Smyrne-Cassaba and Extension Railway.		Miles						Miles.			Miles.			Miles.		English tons.
Light rails:																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	25	...	...	...	...	...	127	...	...	25	...	2	258	4.8	14.271
Number of train-miles : 553 834. Total number of fractures : 2.														Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 22.3.		

INDO-CHINA.

Indo-Chinese Colonial Railways.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
								Miles.			Miles.			Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	183	...	2	236	5	...	370	...	9.8

Number of train-miles : 1 762 153.
Total number of fractures : 2.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 7.

Indo-China & Yunnan Railways.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	25 (1) 58 (2)	534	29 67	9.9

Number of train-miles : 1 941 680.
Total number of fractures : 25 rails broken ; 58 rails cracked.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles ; 92 fractures ; 214 cracks.

GREAT BRITAIN & NORTH OF IRELAND.

Cheshire Lines Committee.

We have no fractures to report for the year 1925.

Great Northern Railway (Ireland).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	3	184	10.19	18

Number of train-miles : 3 568 828.
Total number of fractures : 3.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles ; 5.25.

Isle of Man Railway.

Breakages of rails during the year 1925 were so few - possibly two - that they do not call for any comment.

Kent, Somerset and Shropshire Light Railways Group.

There have been no rail fractures on the Kent, Somerset and Shropshire Light Railways Group during 1925. A reason is that these Railways are limited to 14 to 15-ton axle loads, and the practice has been to use part worn main line permanent way, of 85 lb. to 95 lb. per yard weight. The lines are all standard gauge.

(1) Broken. — (2) Cracked.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Liverpool Overhead Railway					Miles.											English tons.
Light rails : of a weight less than 42.5 kgr. per metre, or 85 lb. per yard.	...	...	...	1	13	...	...	...	...	...	...	...	...	...	...	7 1/2
Total number of fractures : 1																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Londonderry and Lough Swilly Railway.														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per metre, or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	3	70	...	8 1/2
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Metropolitan Railway.					Miles.											English tons.
Medium rails : of 42.5 to 52.5 kgr. per metre (85 to 105 lb. per yard).	...	...	...	1 (86 lb. sec.) 1 (95 lb. sec.)	116 1/2	...	...	...	...	...	...	...	...	...	...	19 1/2
Total . . .	...	...	...	2	116 1/2	...	...	...	...	...	...	...	...	...	...	...
Number of train-miles : 5 197 825.																
Total number of fractures : 2																

County Donegal Railway Joint Committee.

No fractured rail was reported on our system during the year 1925.

London, Midland & Scottish Railway Company. Northern Counties Committee.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	6	180 1/2	20	17 1/2

Number of train-miles : 1 533 347.
Total number of fractures : 6.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 24.

Midland & Great Northern Railways Joint Committee.

There have been no broken rails on our system during the year 1925.

INDIA, DOMINIONS PROTECTORATES & COLONIES.

AFRICA.

Gold Coast Government Railways.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	2	44	28	10 1/2

Number of train-miles : 1 000 000.
Total number of fractures : 2.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 12.5.

Kenya & Uganda Railway.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	4	600	4	4

Number of train-miles : 21 000 000.
Total number of fractures : 4.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles 1.2.

Fractures of rails occurring during the year ended 31 December 1925.

Age of rails.	Light rails 35 to 46 1/4 lb. per yard (17.36 to 22.94 kgr. per m.).	Medium rails 60 to 61 lb. per yard (29.76 to 30.26 kgr. per m.).	Heavy rails 75 to 85 lb. per yard (37.20 to 42.17 kgr. per m.).
South African Railways and Harbours.			
Less than 5 years	1	...	7
5 to 10 years.	...	2	9
10 to 15 years	4	7	66
15 to 20 years	7	2	18
Over 20 years	17	118	18
Age unknown (marks undecipherable)	41	297	25
Number of fractures . . .	70	426	143
Length of single track. . .	2495 miles	5569 miles	3861 miles
Number of fractures per 1000 km. or 625 miles . .	17.5	47.8	23.1
Maximum axle load (English tons)	10 1/2	13 1/2	18

Total miles : 11 925.

Total number of fractures of all classes of rails : 639.
Number of train-miles : 43 839 419.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 91.10.

Note. — The above fractures include those occurring in sidings as well as in running tracks. Fractures of rails in sidings predominate.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load
Fractures of rails occurring during the year ending 31 March 1925.																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Nigerian Railway.								Miles								English tons
Light rails of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	...	...	...	...	...	...	9	1 253	4.5	...	...	...	...	...	...	12 1/2
Number of train-miles : 2 064 008. Total number of fractures : 9.									Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 27.							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
AUSTRALASIA.		Miles.			Miles.									Miles.		English tons.
New South Wales Government Railways.																
Light rails : of a weight less than 42.5 kgr. per m., or 85 lb. per yard	...	5 930	...	...	5 930	...	...	...	...	...	...	...	26	5 930	2.74	20.35
Medium rails : of 42.5 to 52.5 kgr. per m (85 to 105 lb. per yard).	1	552	1.13	...	552	...	...	...	...	...	...	...	1	552	1.13	20.35
Total. . .	1	6 482	0.09	...	6 482	...	...	...	...	...	...	...	27	6 482	2.60	...
Number of train-miles : 24 204 239. Total number of fractures : 28.									Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 7.2							

Fractures of rails occurring during the year ending 30 June 1925.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles		English tons.
South Australia Government Railways																
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	6	1 638	2 29	12.75

Number of train-miles : 6 650 000.
Total number of fractures : 6.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 6.

Fractures of rails occurring during the year 1925.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Number of fractures according to age of rails: Less than 5 years.	5 to 10 years.	10 to 15 years.	15 to 20 years.	Over 20 years.	Total.	Length of running track of this class (weight) of rail.	Number of fractures per 1 000 km. or 625 miles.	*Maximum axle load.*
							Miles.		English tons.
CEYLON.									
Ceylon Government Railway.									
Light rails :									
of 46 1/4 lb. per yard	...	...	...	...	1	6	263	6.2	9
72 to 80 lb. per yard.		1			4		387		14
Medium rails :									
of 88 lb. per yard.	...	...	1	...	...	1	195	3.2	16
Total . . .	...	1	1	...	5	7	845	5.2	...

Number of train-miles : 3 732 978.
Total number of fractures : 7.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 12.

Fractures of rails occurring during the year 1925-1926.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
INDIA.		Miles.			Miles.									Miles.		English tons.
Bengal-Nagpur Railway.																
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	1 569.01	...	1	1 569.01	0.4	...	...	...	...	...	...	26	1 569.01	10.4	
Medium rails :																17.25
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	11	1 518.64	4.51	1	1 518.64	0.41	...	...	...	...	...	...	10	1 518.64	4.1	
Total . . .	11	3 087.65	4 51	2	3 087.65	0.4	...	...	...	...	...	...	36	3 087.65	7.29	...

Number of train-miles : 9 668 949.
Total number of fractures : 49.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 31,67.

Fractures of rails occurring during the year 1924-1925.

1	2	3	4	5	6	7	8	9	10	10 to 20 years 11	12	13	14	15	16	17
Bengal & North Western Railway (including Tirhut Railway).		Miles.			Miles.						Miles.			Miles.		English tons.
Flat footed rails : 41 1/4 lb. and 50 lb. per yard.	...	150.02	...	...	8.39	...	...	...	...	1	577.59	1.08	14	1 330.00	6.58 (1)	9.375

Number of train-miles : 7 921 803.
Total number of fractures : 15.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 11.83.

Fractures of rails occurring during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Bombay, Baroda & Central India Railway (Broad gauge system).		Miles.			Miles.									Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	5	325.864	9.589	17.2
Medium rails : of 42.5 to 52.5 kgr. per m., (85 to 105 lb. per yard).	1	99.538	6.279	2	217.538	5.746	...	...	...	...	...	...	3	673.156	2.785	18
Total. . .	1	99.538	6.279	2	217.538	5.746	...	...	...	...	...	...	8	999.020	5.004	...

Number of train-miles 7 152 731.
Total number of fractures : 11.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 9.601.

It is not possible to give the percentage of breakages in the respective portions of the rails covered by and clear of the fishplates nor the percentage of the fractures according to the appearance of the fracture.

(1) Two of these fractures occurred where a notch had been cut in the flange for a dog spike to arrest creep.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
														Miles.		English tons.
Bombay, Baroda and Central India Railway. Metre gauge system (3 ft. 3 3/8 in.). *Light rails of a weight of:*																
41 1/4 lb. per yard. . . .	...	...	...	...	...	...	...	...	...	...	...	...	17	1182 0769	8.98	8
50 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	30	1411.2071	13.28	10
60 lb. per yard (1). . . .	...	...	...	...	...	...	...	...	...	...	...	...	...	137.7917	...	10.5
Total. . .	...	...	...	...	...	...	...	...	...	...	—	...	47	2731.0757	10.76	...

Number of train-miles : 9 873 000.
Total number of fractures : 47.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 29.75.

The percentage of breakages in the respective portions of the rails covered by and clear of the fishplates is 2.13 and 97.87 %.
Percentage of fractures according to the appearance of fractures is not available.

Burma Railways. | We have had no breakages of rails during the year 1925 or more.

(1) Our 60 lb. rails are only up to 10 years old.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Great Indian Peninsula Railway.		Miles.			Miles.			Miles.								English tons.
Light rails of a weight of :																
62 lb. per yard	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	13 1/2
68 lb. per yard	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13 1/2
69 lb. per yard	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	15 1/2
75 lb. per yard	...	...	...	...	...	...	...	...	..	1	...	...	1	...	...	16 1/2
80 lb. per yard	...	...	...	...	...	...	...	...	...	2	...	...	15	...	...	17 1/2
82 lb per yard	...	...	...	...	...	...	1	...	...	2	...	...	4	...	...	17 1/2
Medium rails :																
85 lb per yard	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	20
87 lb. per yard	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16 1/2
90 lb. per yard	...	88	...	...	...	...	...	...	...	...	...	...	...	...	...	17 1/2
100 lb per yard	...	259	...	...	152	...	...	619	...	...	...	...	...	...	...	20

RAILS.

DETAILS.	60 lb. per yard.	62 lb. per yard.	69 lb. per yard.	75 lb. per yard.	80 lb. per yard.	82 lb. per yard.	85 lb. per yard.	87 lb. per yard.
Miles of railway including sidings.	24.973	56.826	929.746	426.283	909.426	1 418.758	242.092	63.681

A. — The above table shows the total mileage of each section of rails in use on the G. I. P. Railway, and not already detailed.

B. — It is not possible to classify the rails according to age as no record exists; but no rails of the following sections were ordered or purchased since :

60 lb. rails. Not purchased for the last 20 years.
62 lb. — — — —
69 lb. — — — —
75 lb. — — — —

80 lb. rails Not purchased for the last 20 years.
82 lb. — Last year of purchase was 1923-24.
85 lb. — Not purchased for the last 20 years.
87 lb. — — — —

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Madras and Southern Mahratta Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		English tons.
Light rails :																
of 41 1/4 lb. per yard, F. F.	...	...	...	...	19.125	...	...	...	...	...	57.25	...	11	928.375	7.40	8.25
(3 ft. 3 3/8 in. gauge).	Number of train-miles : 2 371 223. — Number of fractures : 11.															
50, 60 and 62 lb. per yard, F. F..	2	329.75	3.82	...	134.25	...	...	209.625	...	...	148.50	...	...	138.50	...	9.5
(3 ft. 3 3/8 in. gauge).	Number of train-miles : 4 192 482. — Number of fractures : 2.															
75 and 76 lb. per yard, F. F. and B. H., and 80 lb. per yard. B. H.	...	33.25	...	...	42.875	...	...	2.00	...	...	156.00	...	5	627.875	4.98	17.95
(5 ft. 6 in. gauge).	Number of train-miles : 4 389 300. — Number of fractures : 5.															
Medium rails :																
90 lb. per yard, F. F. and B. H.	...	166.625	...	1	87.5	7.14	...	...	...	...	...	..	...	...	...	17.95
(5 ft. 6 in. gauge).	Number of train-miles : 1 446 595. — Number of fractures : 1.															

Total number of train-miles : 12 399 600.

Total number of fractures : 19.

Number of fractures per 10 000 000 train kilometres or 6 250 000 train-miles : 9.58.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
South Indian Railway.		Miles.			Miles.									Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	1	1 695.56	0.36	2	1 695.56	0.72	...	...	...	...	...	...	3	1 695.56	1.08	9

Number of train-miles for 1924-1925 : 6 322 894.
Total number of fractures : 6.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 5.8.

IRISH FREE STATE

County Donegal Railways Joint Committee.

Great Northern Railway.

Londonderry & Lough Swilly Railway.

(See under : **Great Britain & North of Ireland.**)

More than 10 years.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
MALAY PENINSULA					Miles.			Miles.								English tons.
Federated Malay States Railways.																
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	2	1 073	1	1	1 073	1							12

Number of train-miles : 4 250 000.
Total number of fractures : 3.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train miles : 4.

All the rail breakages shewn on the form comply with the definition of breakages in Clause 1 (A) of the final summary relating to question II of the London Congress. The information asked for in Clause 2 of the summary is not available but will be forwarded in future years.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
MESOPOTAMIA.														Miles.		English tons.
Iraq Railway.																
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	1	400	1.5625	8.85

Number of train-miles : 732 966.

Total number of fractures : 1.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GREECE.																
State Railways.														Miles.		English tons.
Light rails:																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	9	748	7.5	14.8
Number of train-miles : 2 004 188. Total number of fractures : 9.																
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 27.90.																
North-Western Railway.	During the years 1923, 1924 and 1925, no case of broken rails was reported.															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ITALY.																
State Railways.					Miles.									Miles.		English tons.
Light rails:																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	2625	9 610	169.72	15.7
Medium rails:																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard)	...	...	...	160	2 489	39.95	...	...	...	...	...	...	...	...	...	19.7
Total. . .	...	...	...	160	2 489	39.95	...	...	...	...	...	...	2625	9 610	169.72	...
Number of train-miles : 69 657 145. Total number of fractures : 2 785.																
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 248.43.																

Owing to the lack of detailed information all rails of the light type included in the table were taken as having broken 20 years after being laid, whereas it is quite possible that some of the fractures occurred earlier.

In the medium weight rails, which were all taken as having broken from 5 to 10 years after being laid in the track, we also included the very limited number of those broken after more than 10 years of service.

No figures are given for rails of a weight equal to or over 53 kgr. per metre (106.84 lb. per yard), the maximum weight of rails in service on our system being 50.6 kgr. per lineal metre (102 lb. per yard).

Care will be taken in future to collect all necessary data in accordance with the wishes of the Congress.

North Milan Railway. We are unable to give you any accurate information on the subject of broken rails occurring on our system during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Railway, Tramway and Automobile Company of Emilia.														Miles.		English tons
Light rails :																
of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	4	82	34.08	17.452

Number of train-miles : 303 918. Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 81.7.
Total number of fractures : 4.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Reggio-Emilia Railway.														Miles.		English tons.
Light rails :																
of 27.600 kgr. per m., (55.63 lb. per yard).	...	...	...	...	...	...	...	...	..	...	...	...	0	44	0	11.8
Sardinian Light Railways.																English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	0	429	0	8.9

Number of train-miles : 708 814. Total number of fractures : 0.

Tessin Railway. During the year 1925 no case of broken rail was reported on our lines.

Milan-Bergame-Cremone Interprovincial Steam Tramways. We have nothing to report that would interest you.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
JAPAN. **Japanese Government Railways.**		Miles.			Miles.			Miles.			Miles.			Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	50	2 539.2	12.3	63	715.8	55.0	129	992.6	81.2	96	914.6	65.6	191	2 687.7	44.4	14.75
Number of train-miles: 94 992 946. Total number of fractures: 529.																
												Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles: 44.0.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Chosen Government Railway.		Miles.			Miles.						Miles. 10 to 20 years.			Miles.		Long tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	17	181.2	59	14	231.8	38	...	...	...	116	915.1	79	15	322	29	19
Number of train-kilometres or train-miles: 5 673 836. Total number of fractures: 162.																
												Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles: 178.				
LUXEMBURG. Guillaume-Luxemburg Railways.	(See under Alsace and Lorraine Railways.)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Prince Henry Railway.		Miles.			Miles.			Miles.			Miles.			Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	...	8.197	...	1	11.177	55.5	1	27.563	22.5	1	20.877	29.7	10	42.597	145.8	15.7
Medium rails: of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	...	16.465	...	...	3.728	...	...	7.741	...	...	...	...	...	...	...	15.7
Total. . .	...	24.662	...	1	14.905	41.6	1	35.304	17.6	1	20.877	29.7	10	42.597	145.8	...
Number of train-miles: 846 408. Total number of fractures: 13.																
												Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles: 95.4.				

NORWAY. State Railways.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
																Pounds
Light rails :	19	...	6	19	...	6	31	...	9.8	2	...	0.6	6	...	1.9	39 683

Number of train-miles : 7 457 000 approximately.
Total number of fractures : 77.
Total length of single track : 1 973 miles.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 64.

Classification of breakages :

A. — At the joint : 8 %.

B. — *a*) New clean break : 39 %
b) Part rusted : 1. base : 57 %; 2. head : 4 %.
c) With other oxidization : 0 %.
d) Number of pieces of broken rail ; 2 pieces : 96 %; 3 pieces : 4 %.

HOLLAND. Netherlands Railways.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		Miles.			Miles.			Miles.			Miles.			Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	6	376.2	10	25	135.7	114	31	671.7	29	148	439 0	209	173	938.9	114	15.7
Medium rails : of 42.5 fo 52.5 kgr. per m. (85 to 105 lb. per yard).	9	238.0	23	3	140.7	13	1	251 7	2	...	11.8	...	8	67.4	74	19.7
Heavy rails : of a weight equal to or greater than 53 kgr. per m. or 106 lb per yard.	The Company does not use heavy rails.															
Total . . .	15	614.2	15	28	276.4	63	32	923.4	22	148	450.8	205	181	1 006.3	112	...

Number of train-miles : 20 820 660.
Total number of fractures : 404.
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 120.

	Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	*Medium rails* : of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).
A. — Percentage of breakages in the respective portions of the rails :		
a) Covered by the fishplates	72 %	75 %
b) Clear of the fishplates	28 %	25 %
B. — Percentage of fractures according to the appearance of the fracture :		
a) Fresh and clean fracture through the whole of the rail section : 1. With silvery oval mark ; 2. Without silvery oval mark	21 %	24 %
b) Fractures, part of which are old and much rusted, extending to the outer face of the foot or head of the rail :		
1. Rusted part in the foot	53 %	43 %
2. Rusted part in the head	5 %	19 %
c) Fractures with much rusted parts not extending to the outer face of the foot or head of the rail	21 %	14 %
d) Number of pieces into which the rail is broken : two	93 %	100 %
— — — — three	5 %	
— — — — four	2 %	

The attention of the permanent way staff is not yet sufficiently directed to noticing fractures with silvery oval marks.

NOTA. — The information given in the above tables applies to both the Netherlands State Railway Company and the Dutch Railway Company, known together under the name of Netherlands Railways.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
COLONIES.																
Dutch India Railways.														Miles.		English tons.
Light rails of a weight of																
25.7 kgr. per m. (51.81 lb. per yard)	...	...	...	...	...	...	...	...	...	...	...	...	1	28	22	10.8
25.7 kgr. per m. (51.81 lb. per yard)	...	...	...	...	...	...	...	...	...	...	...	...	1	136	5	9.1
27.8 kgr. per m. (56.00 lb. per yard)	...	...	...	...	...	...	...	...	...	...	...	...	1	58	11	10.8
33.5 kgr. per m (67.53 lb. per yard)	...	...	...	...	...	...	...	...	...	...	...	...	3	146	13	13.5

Number of train-miles : 2 613 904.
Total number of fractures : 6.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 14.

Failures at the fishplate : 2 ; both occurring at level crossings or on lines in the city. Of the other failures only one was a clean break. There were no oval silvery marks.

Our representative at Java informs us that the information is not complete, but we are taking the necessary steps to have full information available for the year 1927.

Semarang-Cheribon Steam Tramway. — We have no information to supply on the subject of failure of rails occurring on our system during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
POLAND.																
State Railways.		Miles.			Miles.			Miles.			Miles.			Miles.		Pounds
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	25	820	19	22	641	21	90	2 351	24	111	2 655	26	1040	6 636	97	40 345
Medium rails : of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	...	...	...	1	79	8	4	289	9	5	313	10	2	101	12	40 345
Total. . .	25	820	19	23	720	18	94	2 640	22	116	2 968	24	1042	6 737	96	...

Number of train-miles : 57 167 181.
Total number of fractures : 1 300.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 141.

The method used for registering the failure of rails in use up to date on the lines of the Polish State Railways is such that this year we are unable to supply the whole of the information asked for with regard to the classification of breakages.

In future the information will be given in accordance with the wishes of the Congress.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
PORTUGAL. **Portuguese Railway Company.**					Miles.			Miles.			Miles.			Miles.		Pounds
Light rails :	...	...	...	...	731.13	...	1	749.46	0.82	7	792.79	5.4	709	799.52	551	38 823
Medium rails :	...	...	...	4	107.57	23.1	2	89.24	13.9	2	45.91	27	...	...	...	38 823
Total. . .	...	...	...	4	838.70	2.96	3	838.70	2.22	9	838.70	6.67	709	799.52	551	...

Number of train-miles : 4 213 559.
Total number of fractures : 725.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 1 069.1

5 to 20 years.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
National Portuguese Railway Company.		Miles.			Miles									Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	115	...	...	115	...	...	...	...	...	...	...	23	115	...	8.9

Number of train-miles : 139 964.

Total number of fractures : 23.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ROUMANIA. **State Railways.**		Miles.			Miles.									Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	12	6 149.18	1.21	50	6 149.18	5.05	...	...	...	...	...	...	1166	6 149.18	117.82	17.7

Number of train-miles : 31 616 256.
Total number of fractures : 1 791.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 352.

Regarding classification of breakages according to the appearance of the section, etc., so far we have not classified our observations in this way, but will endeavour to do so in future.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SWEDEN.		Miles.			Miles.									Miles.		
State railways.																
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	14	5 154 (1)	...	5	5 154 (1)	...	...	...	...	...	...	...	132	5 154 (1)	...	...
Medium rails : of 42.5 to 52 5 kgr. per m., (85 to 105 lb. per yard).	8	104	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total. . .	22	5 258	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Total number of fractures : 190.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Göteborg-Borås and Borås-Alfvesta Railway.		Miles. Weight = 41.18 kgr. per m., (83.01 lb. per yard).			Miles. Weight = 41.18 kgr. per m., (83.01 lb. per yard).									Miles. Weight = 32 kgr. per m., (64.51 lb. per yard).		English tons.
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	5.6	...	...	44.7	...	...	...	...	...	...	...	...	111.8	...	13.8

Number of train-miles : 590 531.

Total number of fractures : Nil.

(1) These figures include the total length of the system which was of this class at the end of the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Halmstad-Nässjö Railway.		Miles.												Miles.		English tons.
Light rails weighing :																
22 kgr. p. m. (44.35 lb. per yard) (*)	...	...	...	...	...	...	...	...	...	...	...	...	4	11	...	13.31 (1)
32 kgr. p. m. (64.51 lb. per yard).	...	...	...	...	...	...	...	...	...	...	...	...	1	221	...	19.01 (2)
41.18 kgr. p. m. (83.01 lb. per yard).	...	22	...	...	...	...	...	...	...	...	...	...	...	...	...	15.75 (3)
Total . . .	...	22	...	...	...	...	...	...	...	...	...	...	5	232	12.2	...

Number of train-miles : 872 794.
Total number of fractures : 5.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 35.5958.

The whole of the breakages were old fractures very much rusted which reached to the outside surface, the flaws having commenced at the fishplate bolt hole.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Helsingborg-Hessleholm Railway.		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. p. m. or 85 lb. per yard.	...	13.9	...	...	...	...	...	...	...	...	...	...	1	80.2	0.85	16.7

Number of train-miles : 365 135.
Total number of fractures : 1.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.059.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Kalmar-Nya Railway.																English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14.8

Number of train-miles : 399 211.
Total number of fractures : 0.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

(*) Will be replaced this year.
(1) At a speed of 20 km. (12.4 miles).— Year 1884. (2) At a speed of 40 km. (24.8 miles).— Year 1904. (3) At a speed of 70 km. (43.5 miles).— Years 1924 to 1926.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	Maximum axle load
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Nässjö-Oskarshamn Railway.		Miles.			Miles.									Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	93	...	...	93	...	...	...	...	...	...	...	...	93	...	13.0
Number of train-miles : 285 836. Total number of fractures : 0.													Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Nora-Bergslagen Railway.														Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	1	107.5	5.79	13.8
Number of train-miles : 224 568. Total number of fractures : 1.													Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 27.6.			
A. — The breakage occurred clear of the fishplates, at 2 ft. 5 7/8 in. from the end of the rail. *B.* — No other appearances of fractures observed;													*B.* — *a*) 1. with « silvery oval mark » in the head; *b*) 1. with the rusted part in the foot; *d*) Two pieces Reason : Defective rolling?			
Norsholm Westervik-Hultsfred Railway.	No breakage happened on our system during 1925.															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Stockholm-Roslagens Railway.														Miles.		English tons.
Light rails: of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	0	132	0	11.8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Stockholm-Västerås-Bergslagen Railway														Miles.		
Light rails :																
of a weight of 40.5 kgr. per m. (81.64 lb. per yard).	...	...	...	...	...	...	...	...	...	...	...	...	3	268	69	...
Medium rails :																
of 43.5 kgr. per m. (87 69 lb. per yard).	...	...	...	...	...	..	...	...	...	...	...	...	0	30	0	...
Total. . .	...	...	...	...	...	...	...	...	...	...	...	...	3	298	69	...

Number of train-miles : 1 166 919.
Total number of fractures : 3.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 16.

Västergötland-Göteborg Railway.

No breakage happened on our system during 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SWITZERLAND. Federal Railways.																English tons.
Total : 1 786 miles.																
Light rails :																
of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	0	...	...	1	...	...	2	...	...	1	...	...	138	...	...	20.1
Total : 1 747 miles.																
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	4	...	...	16	...	...	20	...	...	22	...	...	21	...	...	20.1
Total. . .	4	...	...	17	...	...	22	...	...	23	...	...	159	...	...	...

Number of train-miles : 19 959 758.
Total number of fractures : 225.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 70.2.

We are unable to divide the length of track according to age.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Berne Alpine Railways.		Miles.			Miles.									Miles.		English tons.
***a*) Berne-Loetschberg-Simplon Line.**																
Light rails :																
of a weight less than 42.5 kgr. p. m. or 85 lb. per yard.	0	0.95	0	8	49.10	101	...	...	...	...	...	...	1	7.85	80	19.7
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	0	5.25	0	7	14.78	294	...	...	...	...	...	...	...	...	...	...
Total . . .	...	6.20	..	15	63.88	146	...	...	...	...	...	...	1	7.85	80	...

Number of train-miles : 837 574.
Total number of fractures : 16.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 118.

1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
***b*) Erlenbach-Zweisimmen Line**	Miles.												Miles.		English tons.
Light rails :															
of a weight less than 42.5 kgr. p. m or 85 lb. per yard.	0.53	0	...	...	...	...	...	...	...	...	...	0	14.24	0	12.51

Number of train-miles : 79 681.
Total number of fractures : 0.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
c) Spiez-Erlenbach Line.		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	0.95	0	...	...	...	...	...	...	...	...	...	0	5.60	0	12.51

Number of train-miles : 45 165.
Total number of fractures : 0.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

10 to 20 years.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
d) Bern-Schwarzenburg Line.		Miles.			Miles.											English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	0.79	0	1	10.11	61	...	...	...	...	...	...	...	...	...	12.51

Number of train-miles : 87 033.
Total number of fractures : 1.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 71.3.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
e) Gürbethal Line.		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	1.42	0	...	...	...	...	...	...	...	...	...	2	17.69	70	12.51

Number of train-miles : 175 806.
Total number of fractures : 2.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 70.7.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
f) Berne-Neuenburg Line. (Direct line)		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	0.64	0	...	...	...	...	...	...	...	...	...	1	23.836	26	17.6

Number of train-miles : 218 997.
Total number of fractures : 1.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 28.4

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Less than 5 years. Length of single track of this class.	Less than 5 years. Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	5 to 10 years. Length of single track of this class.	5 to 10 years. Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	10 to 15 years. Length of single track of this class.	10 to 15 years. Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	15 to 20 years. Length of single track of this class.	15 to 20 years. Number of fractures per 1 000 km. or per 625 miles.	More than 20 years. Number of fractures.	More than 20 years. Length of single track of this class.	More than 20 years. Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Fractures of rails occurring during the year 1924.																
Lausanne-Ouchy Railway.		Miles.												Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	0	0.18	0	...	...	...	...	...	...	...	...	...	0	0.93	0	14.8
Number of train-miles	12 291 (0.18 mile section). 43 187 (0.93 mile section).															
Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.																
Total number of fractures : 0.																
Fractures of rails occurring during the year 1925.																
Rhætian Railway.		Miles.												Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	1	172	...	...	...	...	...	...	...	...	...	..	1	172	...	10.8
Number of train-miles : 996 638.																
Total number of fractures : 2.																

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Viège-Zermatt Railway.														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	0	22	0	11.8

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CZECHOSLOVAKIA. State Railways.		Miles.			Miles.			Miles.			Miles.			Miles.		
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	5	457 15	6.8	14	454.47	19.1	46	1 025.48	27.9	52	1 147.92	28.1	599	4 345.61	85.6	...
Medium rails : of 42.5 to 52.5 kgr per m. (85 to 105 lb. per yard).	2	491.45	2.5	6	192.95	19.3	6	451.00	8.3	3	339.16	5.3	5	294.71	10.5	...
Total. . .	7	948.60	4.6	20	647.42	19.2	52	1 476 48	21.9	55	1 487.08	22.8	604	4 640.32	80.9	...

Number of train-miles : 64 810 878.
Total number offractures : 738.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 70.7.

MISCELLANEOUS INFORMATION

[625 .144.4]

1. — Portable rail bending press.

Figs. 1 and 2, p. 1192.

(*Les Chemins de fer et les Tramways.*)

The portable presses for bending, straightening or for breaking rails in use up to the present, are built with a frame of U shape, the ends of which are bent up to take the head of the rail. A screw is fitted at the centre, which can be screwed down so as to exert a steady pressure on the rail to be bent by means of a lever which fits either on the head or into a hole in it. The bottom of the screw works either on a block which in turn presses on to the rail, or directly on the rail itself.

This arrangement has the defect that the pressure exerted by the screw does not act vertically, especially when it is worn.

In the new form of press described below, the screw does not act directly on the rail or on a block placed on the rail : the block has been replaced by a box in which are provided, one above the other, two hollowed-out plates with a ball or hardened piece of steel between them. The end of the screw presses on the upper level face of the top plate and acts through the steel ball, so that the effort transmitted is always vertical, however much worn the parts may be.

Referring to the sketch below :

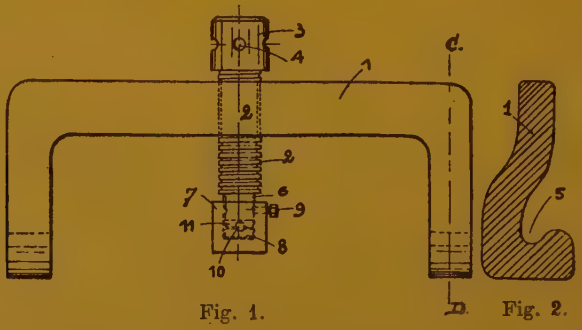


Fig. 1.

Fig. 2.

1 indicates the usual U shaped frame, the two short arms of which are turned up as shewn at 5 in figure 2 to take the rail head. The long or horizontal part of the frame is tapped at its centre to take the square threaded screw 2, the head 3 of which is made suitable for a spanner, or is drilled as at 4 for a bar. On the end 6 of the screw is fitted a box 8, on the same centre line, the underside of which rests on the rail to be bent, straightened or broken. This box has in it a lower plate 11 in the hollowed-out upper face of which is placed a very hard steel ball or block 10 on top of which is placed the upper plate 7 with the concave face downwards, the upper flat face coming up against the end of the screw. For transport the box is kept in position by the end of the set screw 9 fitting into a groove on the end of the main screw.

This arrangement can be used not only on the type of press shewn, but on all kinds of screw or wheel presses in which the effort is transmitted through the end of the screw.

[625 .145.1 (.75)]

2. — Unsymmetrical head rail section produces effects of rail canting.

Fig. 3, p. 1193.

(*Railway Engineering and Maintenance.*

With the view of securing the benefit of canted rail, namely, the more uniform wearing of the rail head with its resultant increase in the life of the rail, which has commonly been attained by means of the canted tie plate or the adzing of the ties on an inclined plane, a modification of one of the standard rail sections has been developed and is being used on the Pittsburgh & Lake Erie, which in effect produces the desired cant without resorting to either of these methods. This is attained solely by the redesign of the standard rail head, which has been changed from a symmetrical section to one having a canted wearing surface. The particular section used on the Pittsburgh & Lake Erie is a slight variation of the 115-lb. Dudley section, which differs from the standard section only in the distribution of the metal in the rail head, the upper surface of the new head having a cant of about 1 in 75, by increasing the height of the rail on the outside 1/32 inch. The center height and other dimensions of the new section have not been changed from those of the standard section.

The development of the canted or unsymmetrical rail head section on the Pittsburgh & Lake Erie was the direct result of the effort on the part of that road to reduce the rapid wear of the head of the standard rail section on the gage side, and to distribute the wear more uniformly over the head without the necessity of installing canted tie plates or injuring the ties. The latter consideration was one of large importance on this road since, for the most part, it has in service hewn ties which were mechanically adzed and bored previous to their treatment. In all cases these ties were adzed in a horizontal plane and drilled with four holes on each end, two diagonal holes being for screw spikes used to secure the tie plates to the ties and the other two for cut spikes to hold the rail in place.

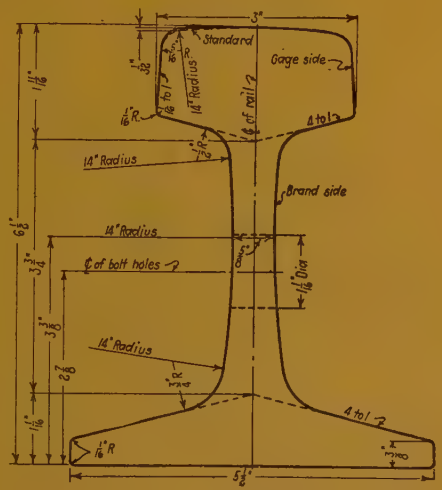


Fig. 3. — The unsymmetrical head rail section is a variation of the standard 115-lb. Dudley section.

With the ties so adzed and bored, it was obvious that to secure the result desired by inclining the rails would throw the rail head inward and produce tight gage, if the same spike holes were used, and on the other hand would seriously injure the ties if the rails were spread at the base a sufficient amount to give proper gage, thus necessitating the redriving of both screw and cut spikes at points removed approximately one-half the diameter of the bit from the original holes. To do this meant not only the mechanical

destruction of the ties, but also greatly reducing the holding power of the spikes. As an alternative to secure the desired rail cant the unsymmetrical rail head was suggested and adopted. The first rail of this section was laid during 1925, in which year the Pittsburgh & Lake Erie purchased 10 000 tons. The results obtained with this rail were so satisfactory that an additional 10 000 tons have been ordered for use in this year's rail program. The rails are all laid with the brand on the gage side so that the slope on the top of the head points down toward the gage side.

The unsymmetrical or canted head rail section was designed by the inspecting engineer's office of the New York Central Lines, in conjunction with A. R. Raymer, chief engineer, Pittsburgh and Lake Erie, who has had general supervision over this rail in service.

[621 .152.3 (.43)]

3. — Multiple pressure locomotive being tested in Germany.

Figs. 4 and 5, pp. 1195 and 1196.

(*Railway Age.*)

In an article reviewing the tendencies in locomotive design during 1925, published in the 2 January 1926 issue of the *Railway Age*, page 47, was included a brief description of a locomotive built in Germany which generates steam at two pressures. This locomotive, known as the Henschel multiple pressure compound locomotive, is of the 4-6-0 type and has three cylinders. The original design was developed by the late Dr. Wilhelm Schmidt, inventor of the Schmidt superheater, and was built jointly by Henschel & Sohn, Kassel, Germany, and the Schmidt Superheater Company. This locomotive was exhibited at the railway exposition held last year at Munich, Germany, and has been undergoing extensive tests on the German State Railways since that time. It was built primarily for experimental purposes with the object of determining the practical possibilities of what has for a considerable time been considered as theoretically most desirable, namely the employment of extremely high pressure steam in combination with two-stage expansion and superheat.

Superheated steam at about 850 lb. pressure per square inch is used in a single high pressure cylinder and the exhaust from this cylinder at about 200 lb. per square inch, is combined with superheated steam at the same pressure drawn from the low pressure section of the boiler, to supply the two low pressure cylinders.

Table of dimensions and proportions of the 4-6-0 high pressure three-cylinder locomotive.

Railroad	German State Railways.
Builders	Henschel & Sohn. Schmidt Superheater Co.
Type of locomotive	4-6-0.
Cylinders, diameter and stroke	1 — 11.4 inches by 24.8 inches. 2 — 19.7 inches by 24.8 inches.
Valve gear, type	Walschaerts.
Wheels, diameter outside tires :	
Driving	78 inches.
Front truck	39.4 inches.
Boiler :	
Steam pressure, high pressure section	850 lb. per square inch.
Steam pressure, low pressure section	200 lb. — — —

Heating surfaces :

Firebox (including all fire heated surfaces)	1 000 square feet.
Heating coils in drum	1 312 — —
Tubes and flues, low pressure section.	2 061 — —

The high pressure section is a water tube boiler similar in many respects to the Brotan type. Two-inch tubes set closely together form the sides, end walls and top of the firebox. The lower ends of the tubes, forming the side and end walls, set in a hollow frame

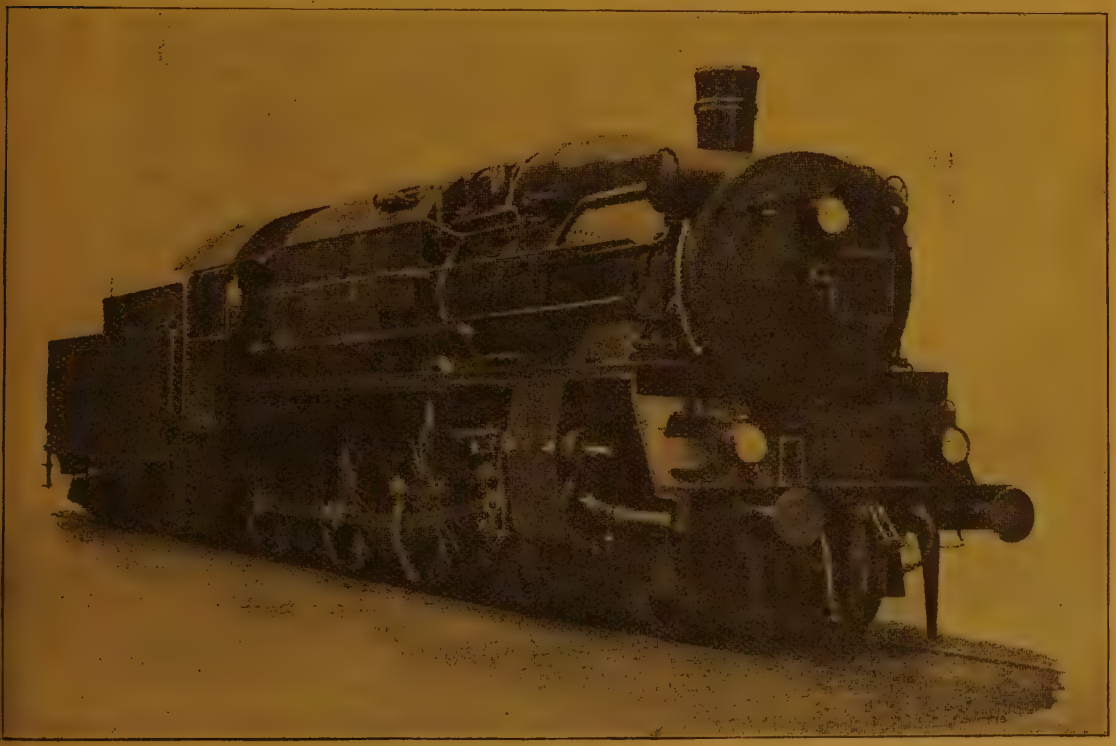


Fig. 4. — Multiple pressure compound locomotive built jointly by Henschel & Sohn and the Schmidt Superheater Company.

which supports the grates. Around the top of the firebox is a second hollow frame in the lower side of which are set the upper ends of the side and end wall tubes and on the inner side the tubes which extend across the top of the firebox. This system of tubes is filled with water about half way to the upper frame. It can withstand the high temperature of the firebox on account of the small diameter of the tubes and the absence of scale. The small tube diameter is permissible on account of the fact that the small bubbles of steam generated from the small amount of water in each tube take about 1/6 of the space of the steam bubbles created in locomotive boilers of the usual design. The comparatively small space taken by the rising bubbles insures a good transmission of heat between the fire and the water. This system of tubes produces steam at about 1 320 lb.

per square inch. The steam from this section is passed into a system of pipes placed inside a large drum which is centrally located above the top of the firebox. This drum is not exposed to the combustion gases, but is heated from the inside by the system of pipes carrying steam at 1 320 lb. pressure. The heat from these pipes is transferred to the water

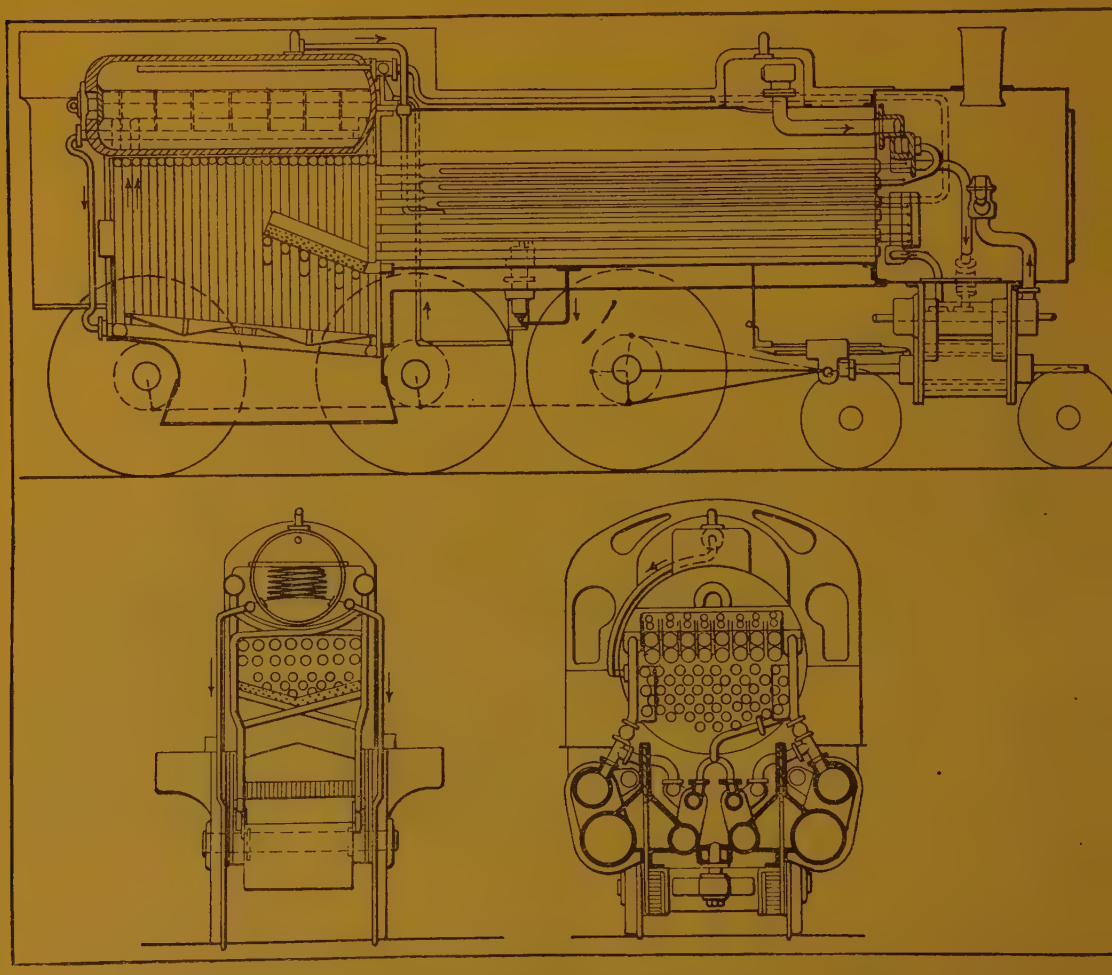


Fig. 5. — Elevation and cross section of the multiple pressure locomotive.

in the drum surrounding the pipes, causing the steam in the piping system to condense. This transfer of heat generates steam in the drum at about 850 lb. pressure. The lower ends of the piping system to the inside of the drum are connected by outside pipes to the lower frame of the firebox which carries the two-inch tubes of the side and end walls. By this arrangement the condensate from the heating pipes in the drum is returned to the tubes forming the firebox and is used over again. The high pressure section of the boiler

thus forms a closed circuit in which steam is generated from distilled water. The utilization of distilled water, of course, eliminates any possibility of scale being formed. Thus one of the greatest difficulties in the operation of the ordinary locomotive is overcome.

The drum is fed with ordinary feedwater from the tank on the tender and trouble may be expected from scale being deposited on the heating coils. For this reason the designers may be required to apply to the locomotive feedwater treating equipment or a device for removing scale from the drum. Any scale deposited on the inside wall of the drum will, of course, have an insulating effect.

The steam at 850 lb. pressure generated in the drum is piped through a superheater, the tubes of which are located in the usual manner inside of the tubes of the low pressure cylindrical boiler, to a high pressure cylinder. This cylinder is placed midway between the two outside or low pressure cylinders and drives direct to the front driving axle. The steam is exhausted from the high pressure cylinder at about 200 lb. to the two low pressure cylinders. This exhaust steam, however, is supplemented by steam from the low pressure section of the boiler, superheated in the usual way by a second superheater, the units of which are also located in the tubes of the low pressure boiler. All the available space in the smoke box is taken up by the two superheaters.

All three cylinders are placed in a horizontal plane and are connected to the front drivers with cranks at 120°. They are equipped with piston valves and extended piston rods which are considered indispensable in Germany. It is reported that the design of the two stuffing boxes of the high pressure cylinder may have to be changed due to the difficulties encountered working under 850 lb. pressure. Complete tests are yet to be made, but it is reported that preliminary tests show an unusual economy in steam.

NEW BOOKS AND PUBLICATIONS

[621.33 (02]

VEROLE (Pietro), engineer. — **La grande trazione elettrica (Main line electric traction).** — One volume in 8vo (9 × 6 1/8 inches) of 921 pages with 573 figures and 23 tables and plates. — 1926, Milan, Ulrico Hoepli, editore libraio della Real Casa, Galleria De Cristoforis. — Price : 80 lires.

There is rather a lack of literature dealing with main line electric traction, as far as books are concerned, although there have been a very great number of articles published in the technical press dealing with certain separate aspects of rolling stock and equipment. We should therefore be grateful to authors who attempt to give their readers a wider and more general view of the question.

In this respect, M. Pietro Verole's work deserves special attention, because it does not deal solely with one particular system or group of systems of electric traction, but with all known systems. Moreover, he deals successively with all the problems which arise in the application of electric power to the hauling of trains, from the power station to the construction and operation of the rolling stock. The author has therefore attempted a very great task. His object, as stated in the preface, is to give a better knowledge of the results already obtained and the possibilities of electric traction, which has not extended in Italy as much as it should in a country which is a large importer of coal and which possesses a great amount of water power.

In the first part, the author deals with central power stations and the primary power lines for conveying the energy; he gives a description of the various plants erected in Italy.

A second part contains an investigation of the power required for working trains.

He then deals with the various traction systems : low tension continuous current and third rail, low frequency three-phase current, single-phase current with overhead wire, single-phase three-phase system, high tension continuous current system.

The low tension continuous current third rail system has been applied in Italy on the Milan-Varese (the first electrified line in Italy) and then extended on the Varese-Porto Ceresio section. This application is described in detail.

The three-phase current has been more widely employed in Italy. This chapter deals very fully with the question : power transmission, transformer sub-stations, overhead lines, disturbing influence on telephone circuits, electric locomotives.

Examples illustrating the single-phase system are those in Switzerland (Gothard, Loetschberg) and in Germany.

The single-phase three-phase system has been applied in America. The author deals with the principal characteristics.

The high tension continuous current system, which is also used in America, and which is the system chosen for the French railways, is also dealt with in a long chapter.

We may mention, as important chapters, the comparison between the various systems of electric traction, brakes for electric rolling stock, the electric locomotive considered as a vehicle, the various methods of transmitting the pow-

er from the motors to the wheels, methods of improving the power factor alternating current traction at frequencies suitable for industrial purposes. The book is concluded by a series of calculations dealing mainly with methods of power transmission.

In this very brief review, we have only dealt with the more important headings, the table of contents itself extending over twelve pages. It should, however, be sufficient, we think, to satisfy the technical reader that he will find full information on all questions of electric traction in this very complete book.

E. M.

[625 .6 (02]

VASSEUR (L.), ingénieur en chef des ponts et chaussées. — **Chemins de fer d'intérêt local, tramways et services publics automobiles** (construction et exploitation) [**Light railways, tramways and public motor bus services** (construction and operation)]. — One volume in 8vo (9 × 6 1/4 inches), of 780 pages with 332 figures. — 1926, Paris, J. B. Baillière & Sons, publishers, 19, rue Hautefeuille. — Price : 90 francs.

This book deals, as its title indicates, with the construction and operation of light railways, tramways and public motor bus services. Railways and adhesion tramways occupy the greater part of the book (sixteen chapters out of nineteen). Public motor bus services are dealt with in chapter XIX. The seventheenth and eighteenth deal with rack railways and funicular railways.

The first ten chapters may be considered the first part, in which the author deals with the construction of the railway and fixed plant. In it he explains how to conduct the *preliminary investigations* (estimate of probable traffic, choice of gauge, influence of gradients, curves and loading gauge as affecting the first cost); he then deals with the construction of the *formation*. A discussion of the *components of the track, its laying, points and crossings, signals and gates* is followed by remarks on the lay-out of *yards, stations and buildings* and of the various equipment which are contained therein.

These various subjects are all treated with special regard to the nature of the lines under consideration.

The same remark applies moreover to the whole work, and especially to the four chapters which deal with the construction of the rolling stock : *trucks and bogies, rolling stock* (wagons and coaches), *traction by steam locomotives and the construction of steam locomotives*. To this is added the now important question of *independent rail cars* which the author deals with in the eleventh chapter. The important development which has taken place in electric traction for urban and suburban railways leads to this question being very fully dealt with in the three chapters entitled : *Power supply and systems used, power lines and contact apparatus, electric equipment of rolling stock.*

The fifteenth chapter deals with *brakes*. In the sixteenth, entitled : *Operation from a technical and financial point of view*, we find some very useful information on the fares and rates and on the returns obtained from light railways, some of which have suffered severely from circumstances arising from the war.

Rack railways and funicular railways, subjects which have been somewhat neglected by writers, are very properly dealt with in a book dealing with light railways. The information is presented in a way which should fully satisfy the

reader who wishes to understand the principles of the arrangements adopted and the results obtained.

Finally, it will be seen that Mr. Vasseur has wished to complete his book by a reference to *public motor bus services*. Although new comers as means of transporting passengers and goods, these have attained a considerable importance during the course of a few years.

Here, as throughout the remainder of the book, it may be noted that the author, while devoting to the description of the rolling stock and equipment the attention which they deserve on the part of the engineer, has also kept in view the economical side of the question, the return which may be obtained on capital invested in various methods of land transport. For this reason his work will be read with interest and frequently consulted with advantage by those who are concerned in any way with the operation of the transport industry, especially by those who have to decide upon the methods most appropriate to the circumstances or who are engaged in the management of such concerns.

E. M.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Stockholm-Västerås-Bergslagen Railway														Miles.		
Light rails :																
of a weight of 40.5 kgr. per m. (81.64 lb. per yard).	...	...	...	...	...	...	...	...	...	...	...	...	3	268	69	...
Medium rails :																
of 43.5 kgr. per m. (87 69 lb. per yard).	...	...	...	...	...	..	...	...	...	...	...	...	0	30	0	...
Total. . .	...	...	...	...	...	...	...	...	...	...	...	...	3	298	69	...

Number of train-miles : 1 166 919.
Total number of fractures : 3.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 16.

Västergötland-Göteborg Railway.

No breakage happened on our system during 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SWITZERLAND. Federal Railways.																English tons.
Total : 1 786 miles.																
Light rails :																
of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	0	...	...	1	...	...	2	...	...	1	...	...	138	...	...	20.1
Total : 1 747 miles.																
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	4	...	...	16	...	...	20	...	...	22	...	...	21	...	...	20.1
Total. . .	4	...	...	17	...	...	22	...	...	23	...	...	159	...	...	...

Number of train-miles : 19 959 758.
Total number of fractures : 225.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 70.2.

We are unable to divide the length of track according to age.

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	5 to 10 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	10 to 15 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	15 to 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles	More than 20 years. Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	*Maximum axle load.*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Berne Alpine Railways.		Miles.			Miles.									Miles.		English tons.
***a*) Berne-Loetschberg-Simplon Line.**																
Light rails :																
of a weight less than 42.5 kgr. p. m. or 85 lb. per yard.	0	0.95	0	8	49.10	101	...	...	...	...	...	...	1	7.85	80	19.7
Medium rails :																
of 42.5 to 52.5 kgr. per m. (85 to 105 lb. per yard).	0	5.25	0	7	14.78	294	...	...	...	...	...	...	...	...	...	...
Total . . .	...	6.20	..	15	63 88	146	...	...	...	...	...	...	1	7.85	80	...

Number of train-miles : 837 574.
Total number of fractures : 16.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 118.

1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
***b*) Erlenbach-Zweisimmen Line**		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. p. m or 85 lb. per yard.	0	0.53	0	...	...	...	...	...	...	...	...	...	0	14.24	0	12.51

Number of train-miles : 79 681.
Total number of fractures : 0.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
c) Spiez-Erlenbach Line.		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	0.95	0	...	...	...	...	...	...	...	...	...	0	5.60	0	12.51

Number of train-miles : 45 165.
Total number of fractures : 0.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

10 to 20 years.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
d) Bern-Schwarzenburg Line.		Miles.			Miles.											English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	0.79	0	1	10.11	61	...	...	...	...	...	...	...	...	...	12.51

Number of train-miles : 87 033.
Total number of fractures : 1.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 71.3.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
e) Gürbethal Line.		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	1.42	0	...	...	...	...	...	...	...	...	...	2	17.69	70	12.51

Number of train-miles : 175 806.
Total number of fractures : 2.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 70.7.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
f) Berne-Neuenburg Line. (Direct line)		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	0	0.64	0	...	...	...	...	...	...	...	...	...	1	23.836	26	17.6

Number of train-miles : 218 997.
Total number of fractures : 1.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 28.4

NAMES OF ADMINISTRATIONS AND DESCRIPTION OF RAILS	Age of rails: Less than 5 years.			5 to 10 years.			10 to 15 years.			15 to 20 years.			More than 20 years.			*Maximum axle load*
	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	Number of fractures.	Length of single track of this class.	Number of fractures per 1 000 km. or per 625 miles.	

Fractures of rails occurring during the year 1924.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Lausanne-Ouchy Railway.		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	0	0.18	0	...	...	...	...	...	...	...	...	...	0	0.93	0	14.8

Number of train-miles { 12 291 (0 18 mile section). 43 187 (0.93 mile section).

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

Total number of fractures : 0.

Fractures of rails occurring during the year 1925.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Rhætian Railway.		Miles.												Miles.		English tons.
Light rails :																
of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	1	172	...	...	...	...	...	...	...	...	...	..	1	172	...	10.8

Number of train-miles : 996 638.

Total number of fractures : 2.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Viège-Zermatt Railway.														Miles.		English tons.
Light rails : of a weight less than 42.5 kgr. per m., or 85 lb. per yard.	...	...	...	...	...	...	...	...	...	...	...	...	0	22	0	11.8

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 0.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CZECHOSLOVAKIA. State Railways.		Miles.			Miles.			Miles.			Miles.			Miles.		
Light rails : of a weight less than 42.5 kgr. per m. or 85 lb. per yard.	5	457 15	6.8	14	454.47	19.1	46	1 025.48	27.9	52	1 147.92	28.1	599	4 345.61	85.6	...
Medium rails : of 42.5 to 52.5 kgr per m. (85 to 105 lb. per yard).	2	491.45	2.5	6	192.95	19.3	6	451.00	8.3	3	339.16	5.3	5	294.71	10.5	...
Total. . .	7	948.60	4.6	20	647.42	19.2	52	1 476 48	21.9	55	1 487.08	22.8	604	4 640.32	80.9	...

Number of train-miles : 64 810 878.
Total number offractures : 738.

Number of fractures per 10 000 000 train-kilometres or 6 250 000 train-miles : 70.7.

MISCELLANEOUS INFORMATION

[625 .144.4]

1. — Portable rail bending press.

Figs. 1 and 2, p. 1192.

(*Les Chemins de fer et les Tramways.*)

The portable presses for bending, straightening or for breaking rails in use up to the present, are built with a frame of U shape, the ends of which are bent up to take the head of the rail. A screw is fitted at the centre, which can be screwed down so as to exert a steady pressure on the rail to be bent by means of a lever which fits either on the head or into a hole in it. The bottom of the screw works either on a block which in turn presses on to the rail, or directly on the rail itself.

This arrangement has the defect that the pressure exerted by the screw does not act vertically, especially when it is worn.

In the new form of press described below, the screw does not act directly on the rail or on a block placed on the rail : the block has been replaced by a box in which are provided, one above the other, two hollowed-out plates with a ball or hardened piece of steel between them. The end of the screw presses on the upper level face of the top plate and acts through the steel ball, so that the effort transmitted is always vertical, however much worn the parts may be.

Referring to the sketch below :

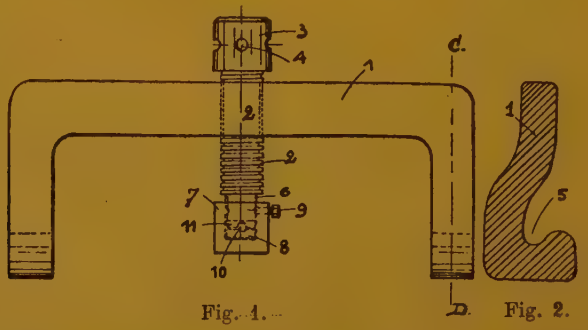


Fig. 1. Fig. 2.

1 indicates the usual U shaped frame, the two short arms of which are turned up as shewn at 5 in figure 2 to take the rail head. The long or horizontal part of the frame is tapped at its centre to take the square threaded screw 2, the head 3 of which is made suitable for a spanner, or is drilled as at 4 for a bar. On the end 6 of the screw is fitted a box 8, on the same centre line, the underside of which rests on the rail to be bent, straightened or broken. This box has in it a lower plate 11 in the hollowed-out upper face of which is placed a very hard steel ball or block 10 on top of which is placed the upper plate 7 with the concave face downwards, the upper flat face coming up against the end of the screw. For transport the box is kept in position by the end of the set screw 9 fitting into a groove on the end of the main screw.

This arrangement can be used not only on the type of press shewn, but on all kinds of screw or wheel presses in which the effort is transmitted through the end of the screw.

[625 .145.1 (.73)]

2. — Unsymmetrical head rail section produces effects of rail canting.

Fig. 3, p. 1193.

(*Railway Engineering and Maintenance.*

With the view of securing the benefit of canted rail, namely, the more uniform wearing of the rail head with its resultant increase in the life of the rail, which has commonly been attained by means of the canted tie plate or the adzing of the ties on an inclined plane, a modification of one of the standard rail sections has been developed and is being used on the Pittsburgh & Lake Erie, which in effect produces the desired cant without resorting to either of these methods. This is attained solely by the redesign of the standard rail head, which has been changed from a symmetrical section to one having a canted wearing surface. The particular section used on the Pittsburgh & Lake Erie is a slight variation of the 115-lb. Dudley section, which differs from the standard section only in the distribution of the metal in the rail head, the upper surface of the new head having a cant of about 1 in 75, by increasing the height of the rail on the outside 1/32 inch. The center height and other dimensions of the new section have not been changed from those of the standard section.

The development of the canted or unsymmetrical rail head section on the Pittsburgh & Lake Erie was the direct result of the effort on the part of that road to reduce the rapid wear of the head of the standard rail section on the gage side, and to distribute the wear more uniformly over the head without the necessity of installing canted tie plates or injuring the ties. The latter consideration was one of large importance on this road since, for the most part, it has in service hewn ties which were mechanically adzed and bored previous to their treatment. In all cases these ties were adzed in a horizontal plane and drilled with four holes on each end, two diagonal holes being for screw spikes used to secure the tie plates to the ties and the other two for cut spikes to hold the rail in place.

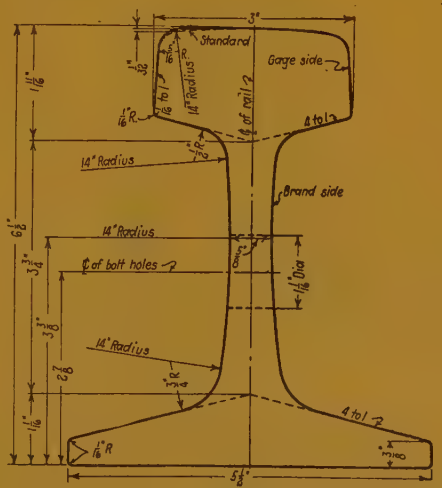


Fig. 3. — The unsymmetrical head rail section is a variation of the standard 115-lb. Dudley section.

With the ties so adzed and bored, it was obvious that to secure the result desired by inclining the rails would throw the rail head inward and produce tight gage, if the same spike holes were used, and on the other hand would seriously injure the ties if the rails were spread at the base a sufficient amount to give proper gage, thus necessitating the redriving of both screw and cut spikes at points removed approximately one-half the diameter of the bit from the original holes. To do this meant not only the mechanical

destruction of the ties, but also greatly reducing the holding power of the spikes. As an alternative to secure the desired rail cant the unsymmetrical rail head was suggested and adopted. The first rail of this section was laid during 1925, in which year the Pittsburgh & Lake Erie purchased 10 000 tons. The results obtained with this rail were so satisfactory that an additional 10 000 tons have been ordered for use in this year's rail program. The rails are all laid with the brand on the gage side so that the slope on the top of the head points down toward the gage side.

The unsymmetrical or canted head rail section was designed by the inspecting engineer's office of the New York Central Lines, in conjunction with A. R. Raymer, chief engineer, Pittsburgh and Lake Erie, who has had general supervision over this rail in service.

[621 .132.3 (.43)]

3. — Multiple pressure locomotive being tested in Germany.

Figs. 4 and 5, pp. 1195 and 1196.

(*Railway Age.*)

In an article reviewing the tendencies in locomotive design during 1925, published in the 2 January 1926 issue of the *Railway Age*, page 47, was included a brief description of a locomotive built in Germany which generates steam at two pressures. This locomotive, known as the Henschel multiple pressure compound locomotive, is of the 4-6-0 type and has three cylinders. The original design was developed by the late Dr. Wilhelm Schmidt, inventor of the Schmidt superheater, and was built jointly by Henschel & Sohn, Kassel, Germany, and the Schmidt Superheater Company. This locomotive was exhibited at the railway exposition held last year at Munich, Germany, and has been undergoing extensive tests on the German State Railways since that time. It was built primarily for experimental purposes with the object of determining the practical possibilities of what has for a considerable time been considered as theoretically most desirable, namely the employment of extremely high pressure steam in combination with two-stage expansion and superheat.

Superheated steam at about 850 lb. pressure per square inch is used in a single high pressure cylinder and the exhaust from this cylinder at about 200 lb. per square inch, is combined with superheated steam at the same pressure drawn from the low pressure section of the boiler, to supply the two low pressure cylinders.

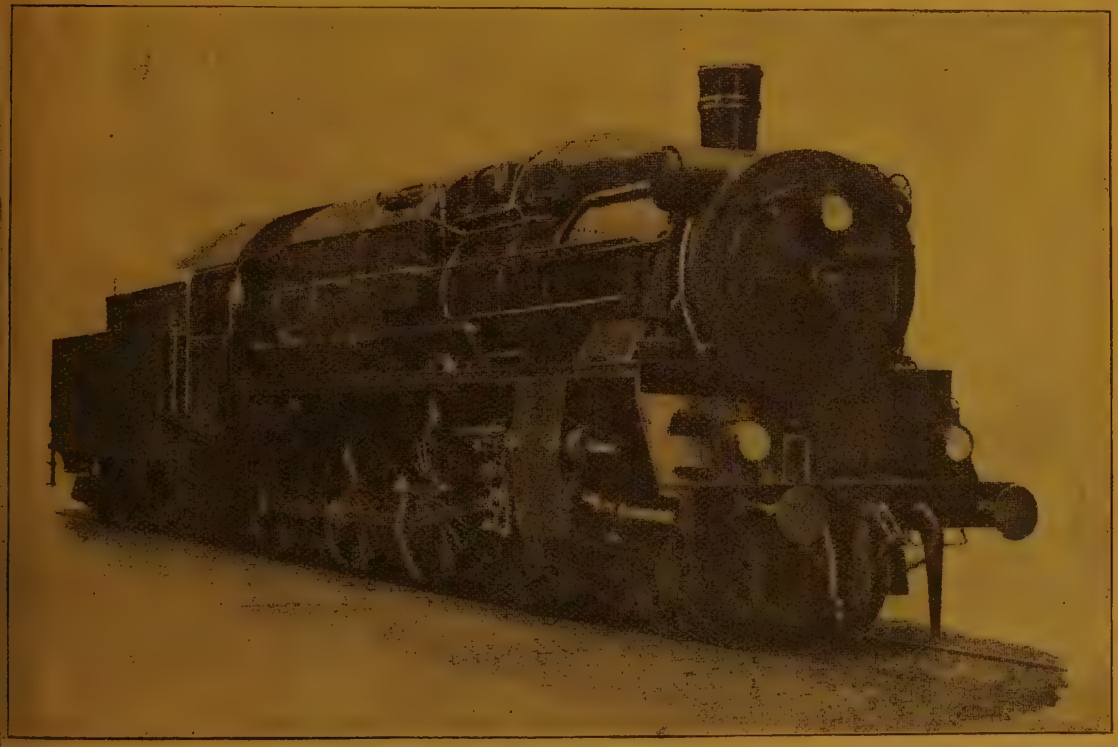
Table of dimensions and proportions of the 4-6-0 high pressure three-cylinder locomotive.

Railroad	German State Railways.
Builders	Henschel & Sohn. Schmidt Superheater Co.
Type of locomotive	4-6-0.
Cylinders, diameter and stroke	1 — 11.4 inches by 24.8 inches. 2 — 19.7 inches by 24.8 inches.
Valve gear, type	Walschaerts.
Wheels, diameter outside tires :	
Driving	78 inches.
Front truck	39.4 inches.
Boiler :	
Steam pressure, high pressure section	850 lb. per square inch.
Steam pressure, low pressure section	200 lb. — — —

Heating surfaces :

Firebox (including all fire heated surfaces)	1 000 square feet.
Heating coils in drum	1 312 — —
Tubes and flues, low pressure section.	2 061 — —

The high pressure section is a water tube boiler similar in many respects to the Brotan type. Two-inch tubes set closely together form the sides, end walls and top of the firebox. The lower ends of the tubes, forming the side and end walls, set in a hollow frame



ig. 4. — Multiple pressure compound locomotive built jointly by Henschel & Sohn and the Schmidt Superheater Company.

which supports the grates. Around the top of the firebox is a second hollow frame in the lower side of which are set the upper ends of the side and end wall tubes and on the inner side the tubes which extend across the top of the firebox. This system of tubes is filled with water about half way to the upper frame. It can withstand the high temperature of the firebox on account of the small diameter of the tubes and the absence of scale. The small tube diameter is permissible on account of the fact that the small bubbles of steam generated from the small amount of water in each tube take about 1/6 of the space of the steam bubbles created in locomotive boilers of the usual design. The comparatively small space taken by the rising bubbles insures a good transmission of heat between the fire and the water. This system of tubes produces steam at about 1 320 lb.

per square inch. The steam from this section is passed into a system of pipes placed inside a large drum which is centrally located above the top of the firebox. This drum is not exposed to the combustion gases, but is heated from the inside by the system of pipes carrying steam at 1 320 lb. pressure. The heat from these pipes is transferred to the water

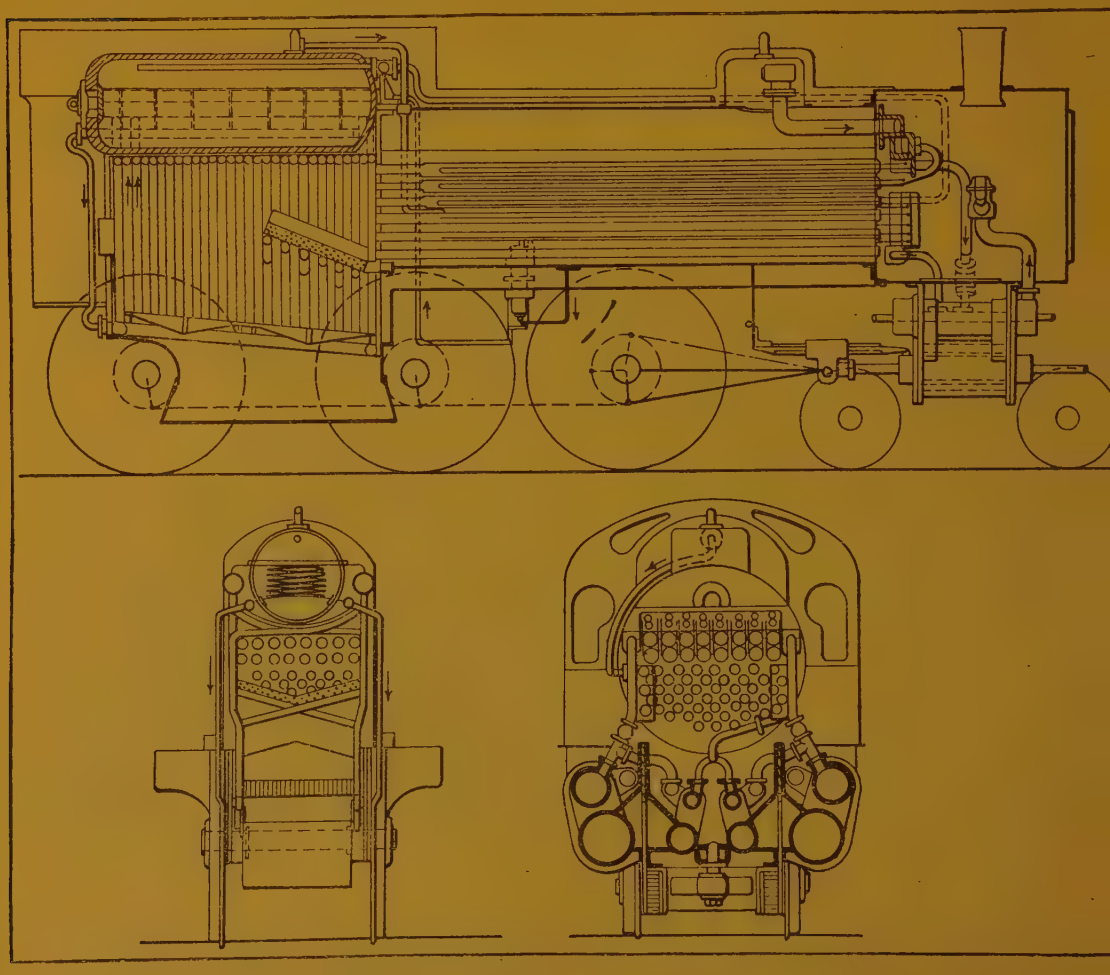


Fig. 5. — Elevation and cross section of the multiple pressure locomotive.

in the drum surrounding the pipes, causing the steam in the piping system to condense. This transfer of heat generates steam in the drum at about 850 lb. pressure. The lower ends of the piping system to the inside of the drum are connected by outside pipes to the lower frame of the firebox which carries the two-inch tubes of the side and end walls. By this arrangement the condensate from the heating pipes in the drum is returned to the tubes forming the firebox and is used over again. The high pressure section of the boiler

thus forms a closed circuit in which steam is generated from distilled water. The utilization of distilled water, of course, eliminates any possibility of scale being formed. Thus one of the greatest difficulties in the operation of the ordinary locomotive is overcome.

The drum is fed with ordinary feedwater from the tank on the tender and trouble may be expected from scale being deposited on the heating coils. For this reason the designers may be required to apply to the locomotive feedwater treating equipment or a device for removing scale from the drum. Any scale deposited on the inside wall of the drum will, of course, have an insulating effect.

The steam at 850 lb. pressure generated in the drum is piped through a superheater, the tubes of which are located in the usual manner inside of the tubes of the low pressure cylindrical boiler, to a high pressure cylinder. This cylinder is placed midway between the two outside or low pressure cylinders and drives direct to the front driving axle. The steam is exhausted from the high pressure cylinder at about 200 lb. to the two low pressure cylinders. This exhaust steam, however, is supplemented by steam from the low pressure section of the boiler, superheated in the usual way by a second superheater, the units of which are also located in the tubes of the low pressure boiler. All the available space in the smoke box is taken up by the two superheaters.

All three cylinders are placed in a horizontal plane and are connected to the front drivers with cranks at 120°. They are equipped with piston valves and extended piston rods which are considered indispensable in Germany. It is reported that the design of the two stuffing boxes of the high pressure cylinder may have to be changed due to the difficulties encountered working under 850 lb. pressure. Complete tests are yet to be made, but it is reported that preliminary tests show an unusual economy in steam.

NEW BOOKS AND PUBLICATIONS

[621. 33 (02]

VEROLE (Pietro), engineer. — **La grande trazione elettrica (Main line electric traction).** — One volume in 8vo (9 × 6 1/8 inches) of 921 pages with 573 figures and 23 tables and plates. — 1926, Milan, Ulrico Hoepli, editore libraio della Real Casa, Galleria De Cristoforis. — Price : 80 lires.

There is rather a lack of literature dealing with main line electric traction, as far as books are concerned, although there have been a very great number of articles published in the technical press dealing with certain separate aspects of rolling stock and equipment. We should therefore be grateful to authors who attempt to give their readers a wider and more general view of the question.

In this respect, M. Pietro Verole's work deserves special attention, because it does not deal solely with one particular system or group of systems of electric traction, but with all known systems. Moreover, he deals successively with all the problems which arise in the application of electric power to the hauling of trains, from the power station to the construction and operation of the rolling stock. The author has therefore attempted a very great task. His object, as stated in the preface, is to give a better knowledge of the results already obtained and the possibilities of electric traction, which has not extended in Italy as much as it should in a country which is a large importer of coal and which possesses a great amount of water power.

In the first part, the author deals with central power stations and the primary power lines for conveying the energy; he gives a description of the various plants erected in Italy.

A second part contains an investigation of the power required for working trains.

He then deals with the various traction systems : low tension continuous current and third rail, low frequency three-phase current, single-phase current with overhead wire, single-phase three-phase system, high tension continuous current system.

The low tension continuous current third rail system has been applied in Italy on the Milan-Varese (the first electrified line in Italy) and then extended on the Varese-Porto Ceresio section. This application is described in detail.

The three-phase current has been more widely employed in Italy. This chapter deals very fully with the question : power transmission, transformer sub-stations, overhead lines, disturbing influence on telephone circuits, electric locomotives.

Examples illustrating the single-phase system are those in Switzerland (Gothard, Loetschberg) and in Germany.

The single-phase three-phase system has been applied in America. The author deals with the principal characteristics.

The high tension continuous current system, which is also used in America, and which is the system chosen for the French railways, is also dealt with in a long chapter.

We may mention, as important chapters, the comparison between the various systems of electric traction, brakes for electric rolling stock, the electric locomotive considered as a vehicle, the various methods of transmitting the pow-

er from the motors to the wheels, methods of improving the power factor alternating current traction at frequencies suitable for industrial purposes. The book is concluded by a series of calculations dealing mainly with methods of power transmission.

In this very brief review, we have only dealt with the more important headings, the table of contents itself extending over twelve pages. It should, however, be sufficient, we think, to satisfy the technical reader that he will find full information on all questions of electric traction in this very complete book.

E. M.

[625 .6 (02]

VASSEUR (L.), ingénieur en chef des ponts et chaussées. — **Chemins de fer d'intérêt local, tramways et services publics automobiles** (construction et exploitation) [**Light railways, tramways and public motor bus services** (construction and operation)]. — One volume in 8vo (9 × 6 1/4 inches), of 780 pages with 332 figures. — 1926, Paris, J. B. Baillière & Sons, publishers, 19, rue Hautefeuille. — Price : 90 francs.

This book deals, as its title indicates, with the construction and operation of light railways, tramways and public motor bus services. Railways and adhesion tramways occupy the greater part of the book (sixteen chapters out of nineteen). Public motor bus services are dealt with in chapter XIX. The seventeenth and eighteenth deal with rack railways and funicular railways.

The first ten chapters may be considered the first part, in which the author deals with the construction of the railway and fixed plant. In it he explains how to conduct the *preliminary investigations* (estimate of probable traffic, choice of gauge, influence of gradients, curves and loading gauge as affecting the first cost); he then deals with the construction of the *formation*. A discussion of the *components of the track, its laying, points and crossings, signals and gates* is followed by remarks on the lay-out of *yards, stations and buildings* and of the various equipment which are contained therein.

These various subjects are all treated with special regard to the nature of the lines under consideration.

The same remark applies moreover to the whole work, and especially to the four chapters which deal with the construction of the rolling stock : *trucks and bogies, rolling stock* (wagons and coaches), *traction by steam locomotives and the construction of steam locomotives*. To this is added the now important question of *independent rail cars* which the author deals with in the eleventh chapter. The important development which has taken place in electric traction for urban and suburban railways leads to this question being very fully dealt with in the three chapters entitled : *Power supply and systems used, power lines and contact apparatus, electric equipment of rolling stock.*

The fifteenth chapter deals with *brakes*. In the sixteenth, entitled : *Operation from a technical and financial point of view*, we find some very useful information on the fares and rates and on the returns obtained from light railways, some of which have suffered severely from circumstances arising from the war.

Rack railways and funicular railways, subjects which have been somewhat neglected by writers, are very properly dealt with in a book dealing with light railways. The information is presented in a way which should fully satisfy the

reader who wishes to understand the principles of the arrangements adopted and the results obtained.

Finally, it will be seen that Mr. Vasseur has wished to complete his book by a reference to *public motor bus services*. Although new comers as means of transporting passengers and goods, these have attained a considerable importance during the course of a few years.

Here, as throughout the remainder of the book, it may be noted that the author, while devoting to the description of the rolling stock and equipment the attention which they deserve on the part of the engineer, has also kept in view the economical side of the question, the return which may be obtained on capital invested in various methods of land transport. For this reason his work will be read with interest and frequently consulted with advantage by those who are concerned in any way with the operation of the transport industry, especially by those who have to decide upon the methods most appropriate to the circumstances or who are engaged in the management of such concerns.

E. M.

MONTHLY BIBLIOGRAPHY OF RAILWAYS (1)

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General secretary of the Permanent Commission of the International Railway Congress Association.

016 .385. 02]

I. — BOOKS.

In French.

1925 621 .94. (02

DAM (I. P.).

Manuel du tourneur-mécanicien. Formules et procédés atiques d'usinage.

Courbevoie (Seine), la Cootypographie, 11, rue de tz. Paris (VI^e), Dunod, éditeur, 92, rue Bonaparte. édition. In-16, 102 pages avec fig. (Prix : fr. 6.75.)

1925 62. (02

ICAMUS (E.), ingénieur des arts et manufactures. Travaux publics. Revisé par Ph. Rousseau, secrétaire néral de la Société française des ingénieurs colo- ux. A l'usage des ingénieurs, architectes, entrepre- urs, conducteurs, agents voyers, métreurs et commis travaux.

Tours, impr. Deslis père, R. et P. Deslis; Paris, nod, 92, rue Bonaparte. 44^e édition, in-16, XXIV-564 ges avec fig. (Prix : 10 francs.)

1925 625 .1 (02

UGUES (J.), professeur, inspecteur divisionnaire des chemins de fer.

Cours pratique de chemins de fer. Service de la voie des travaux.

Angers, impr. centrale; Paris (XVII^e), Edition et priété de l'Ecole du génie civil, 152, rue de Wagram. 8°, 208 pages avec fig.

925 62. (01

EUIL (P.), ancien chef du laboratoire d'essais de la Compagnie P. L. M.

'usure des métaux et les moyens de l'apprécier.

aris (VI^e), Dunod, éditeur, 92, rue Bonaparte.) × 220), de IV-32 pages avec fig. (Prix : 4 francs.)

925 62. (01

EUIL (P.), ancien chef du laboratoire d'essais de la Compagnie P. L. M.

e) essais de fatigue des métaux et les machines sler pour leur exécution.

aris (VI^e), Dunod, éditeur, 92, rue Bonaparte.) × 220), de IV-69 pages avec fig. (Prix : 6 francs.)

925 621 .133.1 (02

NCEL (F.), ancien inspecteur des réceptions de com- bustibles à la Compagnie des chemins de fer P. L. M.

anuel pour l'échantillonnage et l'analyse du charbon aris et Liége, Ch. Béranger, éditeur. In-8°, 136 pages. x : 16 francs.)

1924 385. (09.1 (.495)

CORONIS (Sp. B.), professeur d'économie politique à l'Ecole supérieure technique d'Athènes.

Les chemins de fer et la politique ferroviaire de la Grèce.

Athènes, Extrait de la revue économique « Proche et Extrême-Orient ». (135 × 215), 73 pages, 1 carte, tableaux & fig.

1925 62. (01

DARRAS (M.), ingénieur.

Statique graphique élémentaire et notions préliminaires des résistances des matériaux à l'usage des élèves architectes, ingénieurs, etc., suivies des tables, des poutres et poutrelles en bois et en fer classées par ordre numérique de modules de section 1/v, avec préface de LIEVIN (Auguste), ingénieur des arts et manufactures.

Orléans, impr. H. Tessier; Paris, libr. des sciences Girardot et C^ie, 27, quai des Grands Augustins. 2^e édition revue et corrigée, in-8°, VI-397 pages avec fig.

1925 669 .1 (02

DESCROIX (Louis), ingénieur-conseil, directeur-administrateur de la Revue de métallurgie.

Métallurgie. A l'usage des ingénieurs, maîtres de forges, directeurs et contremaîtres d'usines métallurgiques, de fonderies de métaux, etc. Revu par S. Brull, professeur de métallurgie à l'Ecole supérieure de fonderie de Paris.

Tours, impr. Deslis père, R. et P. Deslis; Paris, Dunod, 92, rue Bonaparte. 41^e édition, in-16, XXVIII-476 pages avec fig. (Prix : 10 francs.)

1925 691. (02

GABARD (A.), ingénieur des arts et manufactures, & METZ (A.), ingénieur des arts et métiers.

Abaques pour le calcul des constructions en béton armé.

Paris, Imprimerie des arts et manufactures, éditeur. 1 album de 53 abaques, format (280 × 380). (Prix : 85 francs.)

1925 621 .134.2 (02

HENNIG (E.), ingénieur principal des chemins de fer de l'Etat belge.

Etude raisonnée de la distribution par tiroir à excentrique unique.

Paris, 15, rue des Saints-Pères (VI^e) et Liége, rue des Dominicains, 8, libr. polytechnique Ch. Béranger. 3^e édition, une brochure in-8° raisin (160 × 250), 46 pages et un atlas de 119 fig. (Prix net : 8 francs.)

(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress conjointly the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to Railway Science », by EISSENBRUCH in the number for November, 1897, of the *Bulletin of the International Railway Congress*, p. 1509.)

1925 691. (02
INSTITUT MODERNE POLYTECHNIQUE, PARIS.
Cours de béton armé. Cours de surveillant.
Paris, René Elias, 40, rue Denfert-Rochereau. 1 vol. autographié in-4°, 526 pages & fig.

1925 691. (02
INSTITUT MODERNE POLYTECHNIQUE, PARIS.
Cours de béton armé. Ingénieur.
Paris, René Elias, 40, rue Denfert-Rochereau. 1 vol. autographié in-4°, 470 pages & fig.

1925 62. (01
JANNIN (L.), ingénieur des arts et métiers.
Comment tenir compte des chocs dans les calculs pratiques de résistance des matériaux.
Paris (VI^e^), 92, rue Bonaparte; Dunod, éditeur. In-16 (160 × 250), de 230 pages avec 84 fig. (Prix : 32 francs.)

1925 621 .43 (02
LE GALLOU (Y.), mécanicien en chef de la marine militaire avec la collaboration de M. F. **Bonhoure**, officier mécanicien de la marine.
Théorie succincte, description, conduite et entretien du moteur Diesel.
Paris (VI^e^), Dunod, éditeur, 92, rue Bonaparte. 2^e^ édition. (190 × 260), de XVI-315 pages avec 187 fig. (Prix : 36 francs.)

1925 621 .3 (02
MONTPELLIER (J. A.), ingénieur-électricien.
Electricité (aide-mémoire pratique de l'électricien). Revisé par L.-D. **Fourcault**, rédacteur en chef de « l'Electricien ». A l'usage des électriciens, ingénieurs, industriels, chefs d'ateliers, mécaniciens et contremaîtres.
Tours, impr. Deslis père, R. et P. Deslis; Paris, Dunod, éditeur, 92, rue Bonaparte. 44^e^ édition, in-16, XX-547 pages avec fig. (Prix : 10 francs.)

1925 62. (01
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1925 62. (01 & 721 .4 (01

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LÉGENS (L.). — **Calcul de l'arc parabolique**, doublement encastré, appliqué en particulier aux voûtes surbaissées. (1 900 mots, 1 tableau & fig.)

1925 621 .132.8 & 621 .335

Génie civil, n° 2250, 26 septembre, p. 275.

Automotrice pétroléo-électrique Westinghouse. (800 mots & fig.)

1925 625 .13 (.73)

Génie civil, n° 2251, 3 octobre, p. 285.

CAUFOURIER (P.). — **Le tunnel de Moffat** sur le Denver and Salt Lake Railroad (Colorado, Etats-Unis). (1 600 mots & fig.)

1925 669 .1

Génie civil, n° 2251, 3 octobre, p. 287.

L'industrie électrothermique des fontes, fers, aciers et des ferro-alliages. (5 400 mots.)

1925 625 .3 (.42)

Génie civil, n° 2251, 3 octobre, p. 291.

Le **chemin de fer continu** ou « never stop railway » de l'Exposition de Wembley, près de Londres. (1 800 mots & fig.)

1925 62. (01

Génie civil, n° 2251, 3 octobre, p. 295.

KOECHLIN (M.). — **La déduction de la section des trous de rivets dans les calculs de résistance.** (350 mots & fig.)

1925 62. (01

Génie civil, n° 2254, 24 octobre, p. 345.

SEIGLE (J.). — **Limite élastique et résistance à la rupture** de barreaux soumis à des efforts combinés de torsion avec traction ou avec compression. (3 900 mots, 1 tableau & fig.)

1925 625 .143.3

Génie civil, n° 2254, 24 octobre, p. 349.

FREMONT (C.). — La tache ovale argentée dans certaines **cassures transversales des rails.** (1 200 mots & fig.)

1925 351 .812 (.44) & 621 .33 (.44)

Génie civil, n° 2255, 31 octobre, p. 377.

BLAEVOET (Ch.). — Les difficultés juridiques soulevées par **l'électrification des chemins de fer et des tramways** en France. (4 500 mots.)

1925 62. (01 & 721 .3

Génie civil, n° 2256, 7 novembre, p. 394.

BORDIER (H.). — **Etude des pylones plans ou polygonaux** constitués par des cadres multiples. (1 100 mots, 1 tableau & fig.)

1925 656 .254

Génie civil, n° 2256, 7 novembre, p. 398.

Nouveau signal, système Wig-Wag, pour passages à niveau. (1 200 mots & fig.)

1925 621 .33

Génie civil, n° 2257, 14 novembre, p. 416.

L'exploitation des **grands réseaux électriques.** (3 800 mots.)

1925 669

Génie civil, n° 2257, 14 novembre, p. 421.

La **fabrication directe de l'acier** à partir du mine de fer. (1 700 mots & 1 tableau.)

1925 62. (01 & 721

Génie civil, n° 2257, 14 novembre, p. 423.

CAUFOURIER (P.). — Le **béton armé** de bar crénelées. Expériences d'adhérence. (1 400 mots & fi

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1925 721

Génie civil, n° 2257, 14 novembre, p. 426.

BATICLE (E.). — La correction des effets dus dilatations ou contractions permanentes dans les voû en béton. (900 mots.)

1925 624 .62 (.

Génie civil, n° 2259, 28 novembre, p. 461.

CAUFOURIER (P.). — **Pont en arc** de 195 mèt de portée sur le Niagara. (2 200 mots & fig.)

1925 62.

Génie civil, n° 2259, 28 novembre, p. 466.

Le centre de glissement, point d'application de l'eff tranchant dans la section d'un **solide prismatique s mis à des efforts extérieurs.** (1 800 mots & fig.)

1925 62.

Génie civil, n° 2260, 5 décembre, p. 492.

WOLKOWITSCH (C.). — Théorie générale de l' **élastique hyperstatique.** (2 300 mots & fig.)

1925 624 .62 (.65) & 625 .13 (.

Génie civil, n° 2261, 12 décembre, p. 501.

DEGUILLAUME (R.). — **La réfection de la tra centrale du pont d'El-Kantara**, à Constantine (Algér (5 700 mots & fig.)

1925 621 .331 (.

Génie civil, n° 2261, 12 décembre, p. 509.

Les **sous-stations automates ou semi-automa** Sous-station semi-automate de Sèvres, sur le réseau la Société des Transports en commun de la Rég parisienne. (5 500 mots & fig.)

1925 621 .132.8 (.9

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Automotrice à vapeur des Chemins de fer de la N velle-Zélande. (550 mots & fig.)

La Science et la Vie. (Paris.)

1925 621 .33 (.

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FOURCAULT (L. D.). — **L'électrification des v ferrées** au moyen des « trains de travaux ». (1 800 m & fig.)

1925 51.

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MARCHAND (J.). — La règle à calculs peut et être utilisée par tous. (4 200 mots & fig.)

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1925 625 .143.2
s ch. de fer et les tramw., novembre, p. 171.
Essai des rails par méthode magnétique. (350 mots.)

1925 621 .132.8
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L'évolution des **automotrices** à essence 1922-1925. 300 mots, 4 tableaux & fig.)

1925 656 .254
s ch. de fer et les tramw., novembre, p. 178.
Les derniers essais de **signalisation de passages à** veau. (5 000 mots & fig.)

1925 621 .133.5
Appareil pour augmenter le **tirage dans les chaudières** locomotives. (900 mots & fig.)

1925 621 .133.4
s ch. de fer et les tramw., novembre, p. 187.
Captation des **flammèches** et escarbilles. (800 mots fig.)

1925 656 .28 (01
s ch. de fer et les tramw., décembre, p. 191.
MAINCENT (J.). — Etude sur les causes principales s **accidents de chemins de fer.** (8 300 mots & fig.)

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BOURGAIN (A.). — Les **funiculaires aériens.** (2 700 ts & fig.)

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1925 656 .254 (.43)
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Appareils de correspondance pour la transmission des lres dans les gares de triage allemandes. (700 mots fig.)

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CAMBOURNAC. — Note sur le nouveau **cahier des** arges des chemins de fer français pour la fourniture s rails en acier. (9 000 mots & fig.)

1925 385 .113 (.44)
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Résultats obtenus en 1924 sur les réseaux des cinq mpagnies principales des chemins de fer français ord, Est, Orléans, Paris-Lyon-Méditerranée et Midi). tableaux.)

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Transmission hydraulique Schneider pour locomotives moteur Diesel. (3 000 mots & fig.)

1925 621 .132.7
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Locomotive de manœuvre type « Sentinel ». (600 mots fig.)

1925 621 .138.5 (.43) & 725 .33 (.43)
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MONTIGNY (H. de). — Note sur l'**atelier de réparation de locomotives** de Nied (près de Francfort-sur-Main). (6 600 mots, 1 tableau & fig.)

1925 385 .4 (.43)
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La loi allemande relative à la **constitution d'une Compagnie des Chemins de fer du Reich.** (15 000 mots.)

1925 625 .143.4 (.73)
Revue générale des ch. de fer, septembre, p. 251.
Nouveaux types de **joints de rails** américains. (600 mots & fig.)

1925 625 .232 (.44)
Revue générale des ch. de fer, octobre, p. 263.
VALLANCIEN (J.). — **Voiture métallique mixte de** 1re et 2e **classes** pour grandes lignes étudiée par l'Office central d'études de matériel de chemins de fer. (6 500 mots & fig.)

1925 385. (06.19
Revue générale des ch. de fer, otobre, p. 285.
Compte rendu sommaire des séances de la 10e **session du Congrès international des chemins de fer** (Londres-1925). (16 700 mots.)

1925 625 .246
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Fermeture des wagons à marchandises. (650 mots & fig.)

1925 656 .254 (.73)
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Système d'avertissement pour barrière de passage à niveau. (500 mots & fig.)

1925 621 .134.2 (.44)
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Application spéciale de tiroirs cylindriques aux cylindres HP de diverses locomotives à vapeur saturée et à tiroirs plans de la Compagnie des chemins de fer de l'Est, transformées en **locomotives à vapeur surchauffée.** (700 mots & fig.)

1925 621 .33 (.44)
Revue générale des ch. de fer, novembre, p. 361.
PARODI. — **Electrification** partielle du réseau de la Compagnie d'Orléans. (8 800 mots, 5 tableaux & fig.)

1925 51. (08 (.44) & 313:625 .2 (.44)
Revue générale des ch. de fer, novembre, p. 391.
SINDOU. — Application des **machines comptables automatiques** à cartes perforées aux statistiques des parcours et tonnages. (3 200 mots & fig.)

1925 656 .255 (.944)
Revue générale des ch. de fer, novembre, p. 408.
Croisement, sur les lignes à voie unique, sans intervention d'agents des gares. (700 mots & fig.)

1925 691 (.42) & 625 .142.2 (.42)
Revue générale des ch. de fer, novembre, p. 409.
Un chantier de **préparation des traverses** en Angleterre. (700 mots & fig.)

1925 **621 .133.7 (.73)**
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Développement des **réchauffeurs d'eau d'alimentation** des locomotives aux Etats-Unis. (900 mots.)

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Réunion annuelle de l'American Railway Association **(Matériel roulant :** graissage des locomotives, niveaux d'eau, robinets-jauges, meulage des roues et des bandages). (1 600 mots & fig.)

1925 **621 .116**
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Chaudières à haute pression. (14 000 mots & fig.)

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PESCHAUD (M.). — **Les chemins de fer de l'Est** et la guerre de 1914-1918. (12 400 mots & 1 tableau.)

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Les **Conventions de Berne** du 23 octobre 1924 au Parlement. (3 600 mots.)

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Le rapport du Conseil d'administration de la **Compagnie des chemins de fer du Maroc.** (1 500 mots.)

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Pose de voie en hiver. (850 mots & fig.)

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Trafic par bacs porte-trains sur le lac Michigan. (1 600 mots & fig.)

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CAMPUS (F.). — Nouvelle étude sur le calcul économique du **béton armé.** (15 000 mots, tableaux & fig.)

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LAMALLE (U.). — Le **Congrès international des chemins de fer.** 10e session, Londres 1925. (13 500 mots.)

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Les nouvelles **voitures automotrices électriques** Chemin de fer du Loetschberg. (900 mots & fig.)

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AUERSWALD. — Die **Eisenbahnen der Erde** im Ja 1923. (750 Wörter u. 1 Tabelle.)

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5 621 .337
ic Railway Journal, No. 21, November 21, p. 905.
AN (L. S.). — Maintaining control magnet . (3 800 words & fig.)

Engineer. (London.)

5 621 .134.2
eer, No. 3626, June 26, p. 711.
motive valve travel. (1 800 words.)

5 621 .132.8 (.42)
eer, No. 3626, June 26, p. 715.
locomotives for the L. & N. E. R. (400 words)

5 624. (01 (.42)
eer, No. 3627, July 3, p. 4.
British standard specification for girder bridges. words.)

5 621 .133.3 (.42)
eer, No. 3627, July 3, p. 20.
ew locomotive boiler feed system. (850 words)

5 621 .338 (.42)
eer, No. 3628, July 10, p. 44.
hern Railway. — **New electric stock.** (1 200 words)

5 621 .134.3
eer, No. 3628, July 10, p. 46.
SLEY (H. N.). — The three-cylinder high-pres- comotive. (2 400 words & 3 tables.)

5 621 .134
er, No. 3629, July 17, p. 65.
e-cylinder locomotives. (1 100 words.)

1925 625 .616
Engineer, No. 3629, July 17, p. 70.
A narrow-gauge express locomotive. (1 000 words & fig.)

1925 621 .132.8 (.494) & 621 .4 (.494)
Engineer, No. 3630, July 24, p. 86.
The Schneider **hydro-mechanical transmission gear.** (2 600 words & fig.)

1925 621 .31 & 621 .43
Engineer, No. 3631, July 31, p. 120.
BUCHI (A.). — **Diesel engines** and hydro-electric power stations. (3 000 words & fig.)

1925 621 .133.7
Engineer, No. 3634, August 21, p. 192.
Locomotive feed heating. (1 200 words.)

1925 656 .28 (.44)
Engineer, No. 3636, September 4, p. 243.
Railway accidents. (1 500 words.)

1925 621 .133.3
Engineer, No. 3636, September 4, p. 244.
Locomotive boilers and steam pressures. (1 100 words.)

1925 621 .132.3 (.66)
Engineer, No. 3636, September 4, p. 247.
Sudan Government Railways : « **Prairie** » **type locomotives.** (850 words & fig.)

1925 385. (09.3 (.42)
Engineer, No. 3639, September 25, p. 323.
A century of railways. (3 000 words.)

Engineering. (London.)

1925 621 .134.3
Engineering, No. 3106, July 10, p. 58.
GRESLEY (H. N.). — The three-cylinder **high-pressure locomotive.** (3 700 words, 3 tables & fig.)

1925 621 .133.4
Engineering, No. 3108, July 24, p. 109.
Smoke-box conditions. (1 700 words.)

1925 691
Engineering, No. 3109, July 31, p. 123.
JAKEMAN (C.). — **Tests of some rust-preventing materials** suitable for the protection of stored machinery. (3 000 words, 7 tables & fig.)

1925 621 .132.8 (.54)
Engineering, No. 3110, August 7, p. 165.
Rack-adhesion locomotive for the Nilgiri Railway. (1 200 words & fig.)

1925 621 .331 (.45)
Engineering, No. 3111, August 14, p. 213.
Portable transformer substations for the Italian Railways. (700 words & fig.)

1925 62. (01

Engineering, No. 3112, August 21, p. 224.

STONEY (G.). — **The failure of materials** in engineering. (1 700 words.)

1925 621 .95

Engineering, No. 3112, August 21, p. 242.

Tools and equipment for **drilling square and hexagon holes.** (2 100 words & fig.)

1925 621 .335 (.45)

Engineering, No. 3113, August 28, p. 262.

Three-phase **electric locomotive** for the Italian Railways. (500 words & fig.)

1925 625 .235

Engineering, No. 3116, September 18, p. 353.

Cast Alpax **railway-coach door.** (1 000 words & fig.)

1925 669 .1

Engineering, No. 3117, September 25, p. 399.

ANDREW (J. H.) & HIGGINS (R.). — **The dilatation of cast irons** during repeated heating and cooling. (3 800 words, 1 table & fig.)

1925 669 .1

Engineering, No. 3118, October 2, p. 432.

FLODIN (H.). — A new direct process for the **manufacture of steel.** (1 500 words & 1 table.)

1925 62. (01 & 669

Engineering, No. 3119, October 9, p. 461.

BROWN (J. S.). — The influence of the time factor **on tensile tests** at elevated temperatures. (4 500 words & fig.)

1925 62. (01 & 669 .1

Engineering, No. 3121, October 23, p. 524.

GREAVES (Dr. R. H.) & JONES (J. A.). — The effect of temperature on the behaviour of **iron and steel in the notched-bar impact test.** (3 400 words & fig.)

1925 624. (01

Engineering, No. 3122, October 30, p. 534.

THORPE (W. H.). — **Steel bridge weights.** (2 200 words, 2 tables & fig.)

Engineering News-Record. (New York.)

1925 656 .213 (.73)

Engineering News-Record, No. 25, June 13, p. 1024.

DAVIS (A. C.). — Work starts on **port development** at Mobile, Alabama. (1 600 words & fig.)

1925 62. (01 & 721 .9

Engineering News-Record, No. 26, June 25, p. 1050.

SLATER (W. A.). — **Tests of bond resistance** in reinforced-concrete beams. (3 000 words & fig.)

1925 624 .7 (.73)

Engineering News-Record, No. 1, July 2, p. 16.

HAYDEN (A. G.). — **Two parkway bridges** planned by engineer and architect. (1 700 words & fig.)

1925 625 .162

Engineering News-Record, No. 2, July 9, p. 56.

HUDSON (W. D.). — **Financing railroad grade c ing elimination.** (2 800 words.)

1925 624 .52

Engineering News-Record, No. 3, July 16, p. 107.

BROWN (N. F.). — New **cantilever bridge** desi with architects' co-operation. (800 words & fig.)

1925 625 .13

Engineering News-Record, No. 5, July 30, p. 171.

HASHIMOTO (Y.). — Driving six-mile **Shi tunnel** on the Japanese Railways. (1 700 words &

1925 62. (01 & 624 .7

Engineering News-Record, No. 5, July 30, p. 182.

MILLER (H. D.). — California road bridge con all tested in field. (900 words & fig.)

1925 624 .63

Engineering News-Record, No. 7, August 13, p. 26

Construction features of **concrete bridge** at Bing ton, N. Y. (900 words & fig.)

1925 625 .13

Engineering News-Record, No. 8, August 20, p. 29

Viaduct is built of reinforced concrete and en steel. (1 100 words & fig.)

1925 625 .13

Engineering News-Record, No. 9, August 27, p. 33

KUSUDA (K.). — Difficulties in **long tunnel** Japanese Railways. (2 000 words & fig.)

1925 725 .33

Engineering News-Record, No. 9, August 27, p. 33

New **tower for water tank houses pumps** at Ro ter, Minn. (1 000 words & fig.)

1925 721 .9

Engineering News-Record, No. 9, August 27, p. 34

Steel frame textile mill building with concrete fl (2 200 words & fig.)

1925 62. (01 & 7

Engineering News-Record, No. 10, September 3, p.

MOORE (H. F.). — **Stress repetition and fatig** steel structures. (1 900 words.)

1925 624 .7

Engineering News-Record, No. 11, September 10, p.

BOCK (C. A.). — **Trough-shaped concrete bridg** sists flotation. (2 000 words & fig.)

1925 625 .13

Engineering News-Record, No. 11, September 10, p.

FIELDNER (A. C.). KATZ (S. H.) & MEI (E. G.). — Continuous C. O. recorder in the **Lib tunnels.** (1 700 words & fig.)

1925 624 .63

Engineering News-Record, No. 11, September 10, p.

HUTCHINGS (J. B.). — **Repairing a failed con arch** at Asheville. (1 200 words & fig.)

1925 62. (01 & 721 .3 (01
gineering News-Record, No. 12, September 17, p. 477.
ELD (J.). — Criticism of the Joint Committee con-te column formulas. (1 000 words & fig.)

1925 624 .52 (.73)
gineering News-Record, No. 13, September 24, p. 504.
ERLETH (C.). — **Cantilever highway bridge** across rquinez Strait. (4 200 words & fig.)

1925 624 .63 (.42)
gineering News-Record, No. 14, October 1, p. 536.
COTT (W. L.). — Scotch **concrete arch bridge** built box girder. (3 200 words & fig.)

1925 624 .1
gineering News-Record, No. 14, October 1, p. 546.
HRISTENSEN (C. L.). — Detail design of **large** dge columns. (3 200 words.)

1925 624 .1 (.73)
gineering News-Record, No. 14, October 1, p. 554.
Bridge pier 228 ft. high for Yosemite Valley Railroad. 0 words & fig.)

925 624 .1 (.73)
gineering News-Record, No. 15, October 8, p. 584.
imber cribs floated to place for **bridge piers.** (1 200 ds & fig.)

925 624 .7 (.73)
gineering News-Record, No. 15, October 8, p. 590.
LACK (S. B.). — **Coastal highway crossing** of the annah River delta. (3 600 words & fig.)

rnal, Permanent Way Institution. (London.)

925 625 .14 (09.3 (.42)
rnal, Perm. Way Inst., August, p. 153.
LAND (F.). — **A century of permanent way.** (9 500 ds & fig.)

925 625 .1 (.66)
rnal, Perm. Way Inst., August, p. 172.
INDLEY (H. D.) & GREENFIELD (M. O.). — An unt of the **construction of the Kassala Railway,** an. (5 000 words, 2 tables & fig.)

925 656 .28
rnal, Perm. Way Inst., August, p. 200.
TIMPSON (C. H.). — **Accidents** — what to do, and to do. (2 400 words.)

Mechanical Engineering. (New York.)

925 621 .7 (.73)
hanical Engineering, May, p. 419.
ILLCOX (L. K.). — Factors concerning the econo- of **shopping steam locomotives.** (7 500 words g.)

925 621 .165. (01
hanical Engineering, June, p. 455.
LOWNEY (W. E.) & WARREN (G. B.). — The ease in thermal efficiency due to **resuperheating** in m turbines. (5 700 words & fig.)

1925 62. (01 & 669. (01
Mechanical Engineering, July, p. 566.
McADAM (D. J.). — **Endurance properties of metals.** (4 800 words, 5 tables & fig.)

1925 621 .116
Mechanical Engineering, July, p. 573.
SHOUDY (W. A.) & DENNY (R. C.). — Recent developments in the **burning of anthracite.** (5 300 words, 1 table & fig.)

1925 669
Mechanical Engineering, August, p. 657.
Castings and forgings. (7 900 words & fig.)

1925 62. (01
Mechanical Engineering, August, p. 664.
The **effect of low and high temperatures** on materials-creep. (2 600 words & fig.)

1925 62. (01
Mechanical Engineering, September, p. 732.
AULT (E. S.). — A comparison of modified **ball-indentation hardness numbers.** (2 000 words, 1 table & fig.)

Modern Transport. (London.)

1925 621 .131.3 (.592) & 621 .132.8 (.592)
Modern Transport, n° 339, September 12, p. 3.
Locomotive experiments in Burma. « Mallet » and « Garratt » articulated engines. (1 500 words & fig.)

1925 621 .131.3 (.54) & 621 .132.8 (.54)
Modern Transport, No. 340, September 19, p. 3.
Locomotive experiments on Indian State Railways. Forthcoming tests between « Garratt » and « Mallet » articulated engines. (1 100 words & fig.)

1925 621 .132.7 (.42) & 621 .334 (.42)
Modern Transport, No. 346, October 31, p. 15.
An **electric shunting tractor.** (700 words & fig.)

1925 385 .3 (.42)
Modern Transport, No. 347, November 7, p. 3.
BELL (R.). — Development of **British Railways.** (4 800 words & fig.)

1925 656 .256.3 (.42)
Modern Transport, No. 350, November 28, p. 3.
Re-signalling of the Mersey Railway. (3 500 words & fig.)

1925 625 .241 (.42)
Modern Transport, No. 350, November 28, p. 7.
Forty-ton trolley wagons for the London Midland & Scottish Railway. (350 words & fig.)

1925 656 .212 (.42)
Modern Transport, No. 352, December 12, p. 13.
New **freight terminal** for Bristol. (1 500 words & fig.)

Proceedings, American Railway Association. (Signal Section.) (New York.)

1925 656 .256.3 (.73)
Proceed. Amer. Ry. Ass^on, Signal Section, Oct., p. 179.
Committee VIII. — Alternating current **automatic block signaling.** (13 500 words & fig.)

1925 656 .25 (.73)
Proceed. Amer. Ry. Ass^on, Signal Section, Oct., p. 238.
Committee I. — Economics of **railway signaling.** (5 500 words.)

1925 656 .254 (.73)
Proceed. Amer. Ry. Ass^on, Signal Section, Oct. p. 250.
Special Committee. — Highway **crossing protection.** (9 900 words.)

1925 656 .256.3 (.73)
Proceed. Amer. Ry. Ass^on, Signal Section, Oct., p. 286.
Committee IV. — Direct current **automatic block signal ng.** (4 600 words, 3 tables & fig.)

Proceedings, American Society of Civil Engineers. (New York.)

1925 385 .571
Proceed. Amer. Soc. Civil Eng., August, p. 1065.
KRUTTSCHNITT (J.). — **The engineer as a railroad executive.** (8 300 words, 2 tables & fig.)

1925 624 .2
Proceed. Amer. Soc. Civil Eng., September, p. 1456.
BEANFIELD (R. McC.) and von ABO (C. V.). — **Secondary stresses in bridges.** (8 000 words, 5 tables & fig.)

1925 691 & 721 .9
Proceed. Amer. Soc. Civil Eng., September, p. 1485.
Report of the Joint Committee on standard specifications for **concrete and reinforced concrete.** (30 000 words, 11 tables & fig.)

1925 62. (01 & 624 .2 (01
Proceed. Amer. Soc. Civil Eng., October, p. 1590.
NISHKIAN (L. H.) & STEINMAN (D. B.). — **Moments in restrained and continuous beams** by the method of conjugate points. (13 900 words, 2 tables & fig.)

1925 624 .2 (01 & 721 .3 (01
Proceed. Amer. Soc. Civil Eng., November, p. 1735.
PRICHARD (H. S.). — Utilizable capacity of **steel members of structures.** (22 000 words, 22 tables & fig.)

1925 62. (01 & 624. (01
Proceed. Amer. Soc. Civil Eng., December, p. 1939.
GOODWIN (R. E.). — **Notes on shear in compression members.** (2 500 words & fig.)

1925 62. (01 & 621 .2 (01
Proceed. Amer. Soc. Civil Eng., December, p. 2065.
RICHART (F. E.). — **Moments in restrained and continuous beams** by the method of conjugate points. (2 400 words & fig.)

Proceedings, Institution of Civil Engineers. (London.)

1924 691. (
Institut. of Civil Eng., Selected engineer. papers, No. 2
TOY (H. C.). — The permeability of **concrete.** (3 4
words, 2 tables & fig.)

1924 691. (
Institut. of Civil Eng., Selected engineer. papers, No. 2
SMITH (H. S.) & CROSTHWAITE (C. D.).— **Cemer mortars :** relation of sand-grading, water-absorptio and compressive strength. (2 700 words, 2 tables & fig

1924 621 .3
Institut. of Civil Eng., Selected engineer. papers, No. 2
MOUNTAIN (R. W.). — **Rotary converters** for ra way use. (3 900 words, 2 tables & fig.)

1924 624 .2 (
Institut. of Civil Eng., Selected engineer. papers, No. 2
HOWLAND (R. C. J.). — Transverse **oscillations girders.** (2 800 words & fig.)

1925 625 .3 (.9
Institut. of Civil Eng., Selected engineer. papers, No. 2
JOHNSON (A. R.). — The **Penang Hills Railwa** (6 500 words & fig.)

1925 62. (
Institut. of Civil Eng., Selected engineer. papers, No. 2
ROBERTSON (A.). — The **strength of struts.** (14 0 words, 4 tables & fig.)

1925 627 (.4
Institut. of Civil Eng., Selected engineer. papers, No. 2
CRUTTWELL (C. H.). — Construction of new **lan ing-stage and other works at Gosport.** (3 200 wor & fig.)

1925 52 .6
Institut. of Civil Eng., Selected engineer. papers, No.
BLENCOWE (S.). — « **Simplified tacheometry :** T merits of a tacheometrical scale for the measureme of vertical angles. » (1 200 words, 2 tables & fig.)

1924-25 62. (01 & 624
Proceed. Institut. of Civil Eng., Vol. CCXIX, p. 125.
STANTON (T. E.). — Report on the measureme of the **pressure of the wind on structures.** (12 6 words, 1 table & fig.)

Proceedings, Institution of Mechanical Engineer (London.)

1925 621 .116. (01 & 621 .133.3 (
Proceed. Inst. of Mechan. Eng., No. 4, May-July, p. 7
Fourth report of the **steam-nozzles** research co mittee. (14 600 words, 22 tables & fig.)

1925 621 .134.1 & 621 .134
Proceed. Inst. of Mechan. Eng., No. 4, May-July, p. 9
CRESLEY (H. N.). — The **three-cylinder hig pressure locomotive.** (15 000 words, tables & fig.)

Railway Age. (New York.)

1925 385. (06.119
lway Age, No. 28, June 13, p. 1423.
'he International Railway Congress. (1 000 words.)

1925 313 .385 (.3)
lway Age, No. 28, June 13, p. 1429.
Railways of the world compared. (900 words & ables.)

1925 625 .243 (.73)
lway Age, No. 28, June 13, p. 1446.
Box cars exhibited at Chicago. (1 200 words & fig.)

1925 656 .253 (.73)
lway Age, No. 28, June 13, p. 1455.
ECK (W. J.). — Southern installs train control. 300 words & fig.)

1925 656 .212.5 (.73)
ilway Age, No. 29, June 20, p. 1509.
LEWIS (E. R.). — Michigan Central yard at Toledo edites interchange. (2 800 words & fig.)

1925 621 .131.2 (.73)
ilway Age, No. 29, June 20, p. 1551.
Report on locomotive design and construction. (6 600 rds, 1 table & fig.)

1925 621 .335 & 621 .338
ilway Age, No. 29, June 20, p. 1560.
Report on electric rolling stock. (4 400 words.)

1925 625 .245
ilway Age, No. 29, June 20, p. 1563.
Report of Committee on tank cars. (3 900 words.)

1925 625 .246 (.73)
ilway Age, No. 29, June 20, p. 1566.
Committee on car construction. (9 400 words & fig.)

1925 625 .252 (.73)
ilway Age, No. 29, June 20, p. 1578.
Report on brakes and brake equipment. (4 400 words fig.)

1925 621 .131.3 (.73)
ilway Age, No. 30, June 27, p. 1623.
Missouri Pacific tests three-cylinder locomotive. 000 words, 1 table & fig.)

1925 656 .211.4 (.73)
ilway Age, No. 1, July 4, p. 7.
LACHER (W. S.). — Noteworthy passenger terminal npleted at Chicago. (17 700 words & fig.)

1925 621 .33 (.73)
ilway Age, No. 1, July 4, p. 31.
Staten Island electrification. (4 000 words & fig.)

1925 625 .242 (.73) & 691 (.73)
ilway Age, No. 1, July 4, p. 41.
REEVE (A. B.). — The development of the reinced concrete car. (3 000 words & fig.)

1925 385. (06.119
Railway Age, No. 2, July 11, p. 80.
DUNN (S. O.). — International Railway Congress. (6 800 words & fig.)

1925 621 .132.8 & 621 .4
Railway Age, No. 2, July 11, p. 88.
Status of oil-engine locomotives. (3 400 words & fig.)

1925 656 .253 (.73)
Railway Age, No. 2, July 11, p. 97.
Union Pacific installs train control. (2 500 words & fig.)

1925 621 .138.1 (.73)
Railway Age, No. 3, July 18, p. 144.
Smoke problems discussed at Grand Rapids meeting. (3 800 words & fig.)

1925 656 .253 (.73)
Railway Age, No. 4, July 25, p. 171.
Great Northern signals main line. (3 500 words, 1 table & fig.)

1925 621 .132.7 (.73)
Railway Age, No. 4, July 25, p. 195.
Pennsylvania builds eight-wheel switching locomotive. (800 words & fig.)

1925 625 .232 (.73)
Railway Age, No. 5, August 1, p. 216.
New Pullman equipment for L. & N. pan-american trains. (2 100 words & fig.)

1925 621 .335 (.73)
Railway Age, No. 5, August 1, p. 231.
Oil electric locomotive performance. (1 500 words & fig.)

1925 621 .334 (.73) & 656 .212.6 (.73)
Railway Age, No. 5, August 1, p. 235.
Electric trucks in transfer service. (1 700 words & fig.)

1925 621 .132.3 (.73)
Railway Age, No. 5, August 1, p. 239.
Santa Fe type locomotive converted to 4-8-2. (1 000 words & fig.)

1925 625 .111 (.73)
Railway Age, No. 6, August 8, p. 262.
Norfolk & Western double tracks its big sandy line. (2 000 words & fig.)

1925 621 .132.5 (.73)
Railway Age, No. 6, August 8, p. 269.
Three-cylinder 4-10-2 locomotives for the S. P. and U. P. (1 100 words, 1 table & fig.)

1925 656 .257 (.73)
Railway Age, No. 7, August 15, p. 305.
C. B. & Q. controls switches remotely. (1 800 words & fig.)

1925 625 .142.2
Railway Age, No. 7, August 15, p. 311.
GOLTRA (W. F.). — What is the average life of ties. (2 600 words, 1 table & fig.)

1925 621 .132.5 (.71)
Railway Age, No. 7, August 15, p. 317.
Mountain type locomotive for Canadian National. (500 words.)

1925 656 .28 (01 (.73)
Railway Age, No. 7, August 15, p. 322.
Accident investigations — October, November and December 1924. (3 500 words.)

1925 625 .1 (.73)
Railway Age, No. 8, August 22, p.349.
Building a railroad in record time. (2 100 words & fig.)

1925 656 .253 (.73)
Railway Age, No. 8, August 22, p. 354.
PEABODY (J. A.). — C. & N. W. installs train control. (2 600 words & fig.)

1925 621 .132.8 (.73)
Railway Age, No. 8, August 22, p. 359.
Great Northern acquires Mallet locomotives. (1 700 words & fig.)

1925 625 .27 (.73)
Railway Age, No. 8, August 22, p. 366.
Monon shows proficiency in handling car material. (1 600 words & fig.)

1925 621 .335 (.73)
Railway Age, No. 9, August 29, p. 389.
D. T. & I. electric locomotive completed. (2 200 words & fig.)

1925 621 .139 (.73) & 625 .18 (.73)
Railway Age, No. 9, August 29, p. 395.
Resourcefulness seen in stores developments on Monon. (2 100 words & fig.)

1925 656 .253 (.73)
Railway Age, No. 9, August 29, p. 401.
O.-W. R. & N. train control approved. (4 400 words.)

1925 656 .211.7 (.73)
Railway Age, No. 10, September 5, p. 429.
Car ferries aid transportation. (2 900 words, 2 tables & fig.)

1925 621 .132.5 (.73)
Railway Age, No. 10, September 5, p. 439.
Consolidation type locomotive for Lehigh & Hudson River. (500 words, 2 tables & fig.)

1925 725 .33 (.73)
Railway Age, No. 10, September 5, p. 445.
DAVIDSON (J. H.). — Benefits of better water on M-K-T. (2 200 words, 1 table & fig.)

1925 621 .131.3 (.73)
Railway Age, No. 11, September 12, p. 467.
BUTLER (F. A.). — Tests of 2-8-4 locomotive on B. & A. (2 000 words, 2 tables & fig.)

1925 725 .33 (.73)
Railway Age, No. 11, September 12, p. 479.
WADE (J. W.) & KELLY (L. L.). — Norfolk & Western builds large oilhouse. (2 000 words & fig.)

1925 621 .132.8 (.7
Railway Age, No. 12, September 19, p. 507.
WANAMAKER (E.). — Rock Island conve McKeen cars to gas electric drive. (2 700 words & fi

1925 725 .33 (.7
Railway Age, No. 12, September 19, p. 517.
BARDWELL (R. C.). — Providing a railroad's wa supply. (2 500 words & fig.)

1925 621 .87 (.7
Railway Age, No. 12, September 19, p. 529.
New York Central increases capacity of pier. (1 4 words & fig.)

1925 621 .132.8 (.7
Railway Age, No. 12, September 19, p. 531.
Mack rail car with multiple unit motor control. (1 0 words & fig.)

1925 621 .33 (.7
Railway Age, No. 13, September 26, p. 553.
Virginian starts electric operation. (1 000 words & fig

1925 625 .1 (06 (.7
Railway Age, No. 13, September 26, p. 567.
Roadmasters discuss problems at Kansas City. (11 5 words.)

1925 656 .212.5 (.7
Railway Age, No. 14, October 3, p. 602.
Chesapeake & Ohio completes modern hump yar (2 200 words & fig.)

1925 614 .8 (.7
Railway Age, No. 14, October 3, p. 615.
Safety Council holds annual Congress at Clevelan (5 200 words.)

1925 621 .335 (.73
Railway Age, No. 15, October 10, p. 645.
Baldwin builds Diesel-electric locomotive. (2 000 word & fig.)

1925 656 .212.7 (.73) & 725 .32 (.73
Railway Age, No. 15, October 10, p. 663.
KELLY (L. L.). — Norfolk & Western builds freigh station at Bluefield. (1 600 words & fig.)

1925 621 .132.8 (.71) & 621 .335 (.71
Railway Age, No. 16, October 17, p. 695.
Diesel-electric cars for the Canadian National. (3 40 words & fig.)

1925 656 .212 (.73
Railway Age, No. 16, October 17, p. 705.
HOEBEL (O. L.). — Rail terminals rebuilt at Pueblo (3 700 words & fig.)

1925 621 .33 (.73
Railway Age, No. 16, October 17, p. 719.
A. E. R. A. report on heavy electric traction. (1 900 words, 3 tables & fig.)

1925 625 .258 (.4) & 656 .259 (.4)
Railway Age, No. 17, October 24, p. 743.
Car retarders used in Europe. (2 700 words & fig.)

925 621 .131.3 (.73)
lway Age, No. 17, October 24, p. 752.
'RY (L. H.). Influence of the **testing plant on** motive designs. (3 000 words & fig.)

925 621 .4 (.73) & 621 .335 (.73)
lway Age, No. 17, October 24, p. 757.
Double end controlled **Brill gas-electric car.** (1 000 rds & fig.)

925 656 .253 (.73)
lway Age, No. 17, October 24, p. 759.
'OCUM (A. H.). — Reading uses **continuous control.** 500 words & fig.)

925 625 .1 (.728)
lway Age, No. 18, October 31, p. 792.
HAW (B. B.). — **Building a railroad** under unusual ditions. (2 000 words & fig.)

925 656 .253 (.73)
lway Age, No. 18, October 31, p. 805.
reat Northern **train control** petition denied. (6 800 ds.)

Railway Engineer. (London.)

925 621 .132.8 (.931)
lway Engineer, June, p. 195.
new **steam rail car.** (1 200 words & fig.)

925 621 .335 (.43)
lway Engineer, June, p. 203.
-C-2 (4-6-4) single-phase express locomotives for Magdeburg-Leipzig-Halle division of te German te Railways. (2 600 words & fig.)

925 625 .4 (.73)
lway Engineer, June, p. 207.
xtensions to New York's **underground.** (1 400 words ig.)

925 625 .143.2
lway Engineer, July, p. 221.
xperiments in the quench-hardening of steel rails. 00 words & 11 tables.)

925 656 .25 (01
way Engineer, July, p. 230.
ATTERSALL (A. E.). — The economic aspect of alling. (3 200 words & fig.)

925 621 .132.5 (.54)
way Engineer, July, p. 243.
ew **4-8-0 type locomotives** for the Madras & South-Mahratta Railway. (350 words & fig.)

925 385. (09.3 (.42)
way Engineer, August, p. 257.
elebration of the **railway centenary.** (5 900 words g.)

925 621 .132.5 (.42) & 621 .132.8 (.42)
way Engineer, August, p. 267.
N. E. R. **locomotive developments.** Garratt 0 + 0-8-2 six-cylinder and 2-8-2 three-cylinder ht engines. (1 200 words & fig.)

1925 621 .7 (.42) & 725 .45 (.42)
Railway Engineer, August, p. 278.
Progressive building of **railway carriages and wagons.** (4 200 words & fig.)

1925 621 .134.1 (.42)
Railway Engineer, September, p. 297.
GRESLEY (H. N.). — **The three-cylinder high-pressure locomotive.** (2 800 words & fig.)

1925 621 .138.5 (.44)
Railway Engineer, September, p. 302.
BLOCH (M.). **Works organisation system** in the main **locomotive shops** of the Paris-Orleans Railway. (4 300 words & fig.)

1925 621 .132.5 (.73)
Railway Engineer, October, p. 345.
A new development in **American locomotive practice.** (2 000 words & fig.)

1925 621 .132.3 (.68)
Railway Engineer, October, p. 350.
New **Baldwin locomotives** for the South African Railways. (600 words & fig.)

Railway Engineering & Maintenance. (Chicago.)

1925 625 .123 (.73)
Railway Engineering & Maintenance, July, p. 256.
A striking demonstration of the value of **drainage.** (2 200 words & fig.)

1925 624 .8 (.73)
Railway Engineering & Maintenance, July, p. 259.
McMARTIN (J.). — Delaware & Hudson **converts fixed truss into lift span.** (2 000 words & fig.)

1925 725 .33 (.73)
Railway Engineering & Maintenance, July, p. 263.
Huntington W. Va., **water facilities** have interesting features. (1 600 words & fig.)

1925 625 .154 (.73) & 625 .13 (.73)
Railway Engineering & Maintenance, July, p. 266.
Some interesting **foundation problems** result from unstable soils. (1 100 words & fig.)

1925 625 .142.2
Railway Engineering & Maintenance, July, p. 269.
Promoting uniform **grading of ties.** (1 000 words & fig.)

1925 625 .144.4 (.73)
Railway Engineering & Maintenance, July, p. 273.
Accurate adzing of ties secured by new scoring machine. (1 100 words & fig.)

1925 725 .33 (.73)
Railway Engineering & Maintenance, August, p. 309.
DAVIDSON (J. H.). — Missouri-Kansas-Texas **improves water supplies.** (3 800 words & fig.)

1925 721 .9 (.73)
Railway Engineering & Maintenance, August, p. 315.
BOUILLON (A. M.). — Some important requirements for **good concrete.** (3 800 words & fig.)

1925 **625 .122 (.73)**
Railway Engineering and Maintenance, Sept., p. 339.
DYKE (R. L.). — **Concrete cribbing** replaces wall. (650 words & fig.)

1925 **625 .19 (.73)**
Railway Engineering and Maintenance, Sept., p. 345.
HOFF (C. P.). — A practical method of collecting **maintenance cost data.** (2 000 words & fig.)

1925 **625 .13 (.73)**
Railway Engineering and Maintenance, Sept., p. 348.
SALMON (J. M.). — **Rebuilding bridge viaducts** under extreme difficulties. (1 000 words & fig.)

1925 **625 .142.2**
Railway Engineering and Maintenance, Sept., p. 351.
BELCHER (R. S.). — How the railways have reduced their **tie requirements.** (1 500 words & fig.)

1925 **725 .33 (.73)**
Railway Engineering and Maintenance, Oct., p. 377.
MACHEMER (H. W.). — New Lackawanna **water station** shows low operating cost. (2 300 words & fig.)

1925 **625 .13 (.73)**
Railway Engineering and Maintenance, Oct., p. 381.
Enlarge section in **relining tunnels** on the Union Pacific. (1 500 words & fig.)

Railway Gazette & Railway News. (London.)

1925 **621 .132.8 (.42)**
Railway Gazette & News, No. 4, July 24, p. 149.
« Sentinel-Cammell » **steam rail cars,** L. N. E. R. (500 words & fig.)

1925 **625 .142.2 (.941)**
Railway Gazette & News, No. 5, July 31, p. 181.
Reconditioning railway sleepers in Australia. (1 400 words.)

1925 **625 .215 (.42)**
Railway Gazette & News, No. 6, August 7, p. 204.
A compensated **spring-frame bogie.** (450 words & fig.)

1925 **625 .232 (.42)**
Railway Gazette & News, No. 6, August 7, p. 205.
New **articulated express passenger trains,** Great Western Railway. (1 000 words & fig.)

1925 **621 .132.8 (.945)**
Railway Gazette & News, No. 6, August 7, p. 210.
New **petrol rail motors,** Victorian Government Railways. (300 words & fig.)

1925 **621 .33 (.73)**
Railway Gazette & News, No. 7, August 14, p. 228.
Railway electrification in the United States. (2 300 words & fig.)

1925 **656 .211.5 (.4**
Railway Gazette & News, No. 7, August 14, p. 232.
Loud speakers on **Paris station platforms.** (300 wor & fig.)

1925 **625 .616 (.5**
Railway Gazette & News, No. 8, August 21, p. 255.
New **4-8-0 type locomotives** for the Madras & Sout ern Mahratta Railway. (350 words & fig.)

1925 **621 .95 (.4**
Railway Gazette & News, No. 9, August 28, p. 278.
Four-spindle **firebox** and boiler shell **drilling m** chine. (500 words & fig.)

1925 **621 .337 (.49**
Railway Gazette & News, No. 9, August 28, p. 280.
One-man control for **electric locomotives.** (600 w & fig.)

1925 **621 .132.6 (.**
Railway Gazette & News, No. 9, August 28, p. 282.
New **tank locomotives** for the Lima Railway. (2 words & fig.)

1925 **621 .33 (.4**
Railway Gazette & News, No. 10, September 4, p. 3
Southern Railway electrification. — I. Coulsd (North) and Sutton. (1 600 words & fig.)

1925 **621 .131.3 (.592) & 621 .132.8 (.59**
Railway Gazette & News, No. 11, September 11, p. 3
Comparative locomotive tests on the Burma Ra ways. (600 words & fig.)

1925 **625 .216 (.5**
Railway Gazette & News, No. 12, September 18, p. 3
Automatic couplings on Japanese Railways. (8 words.)

1925 **625**
Railway Gazette & News, No. 13, September 25, p. 38
The « **railplane** » system of transport. (1 000 wor & fig.)

1925 **621 .132.3 (.73**
Railway Gazette & News, No. 14, October 2, p. 401.
The largest **passenger engine** in the world. (300 word & fig.)

1925 **656 .254 (.73**
Railway Gazette & News, No. 15, October 9, p. 426.
The world's largest **railway telegraph office.** (1 00 words & fig.)

1925 **621 .132.3 (.436**
Railway Gazette & News, No. 15, October 9, p. 430.
Heavy continental **4-8-0 type locomotive.** (400 word & fig.)

1925 **385. (09.1 (.91**
Railway Gazette & News, No. 15, October 9, p. 433.
The **Federated Malay States Railways.** (800 word & fig.)

Railway Magazine. (London.)

925 656 .222.1 (.42)
lway Magazine, July, p. 47.
— — August, p. 151.
— — September, p. 219.
— — October, p. 303.
— — November, p. 369.
— — December, p. 455.
LLEN (C. J.). — **British locomotive practice and** ormance. (28 800 words, tables & fig.)

925 385. (09.3 (.42)
way Magazine, July, p. 1.
he **Stockton and Darlington Railway.** (7 900 words g.)

925 385. (09.3 (.42)
way Magazine, August, p. 101.
25-1925. The **railway centenary celebrations** at lington, July 1-3. (8 600 words & fig.)

925 656 .222.1 (.42)
way Magazine, September, p. 204.
itish **express trains** in the summer of 1925. (3 600 ls & 8 tables.)

925 621 .33 (.42)
way Magazine, September, p. 229.
burban **electrification** on the Southern Railway. 00 words & fig.)

Railway Mechanical Engineer. (New York.)

25 621 .95 (.73)
way Mechanical Engineer, May, p. 295.
URLEY (L. R.). — A **versatile tool** for locomotive ir shops. (2 000 words, 2 tables & fig.)

25 621 .138.5 (.73)
way Mechanical Engineer, June, p. 325.
signment of locomotives for **enginehouse repairs.** 00 words & fig.)

25 625 .26 (.73)
way Mechanical Engineer, June, p. 333.
ASKITT (J. M.). — A modern **freight car repair** . (3 600 words, 3 tables & fig.)

25 621 .138.3 (.73)
way Mechanical Engineer, June, p. 355.
LCOX (L. K.). — A logical policy of **locomotive** tenance. (6 200 words & fig.)

25 385. (07.12 (.73)
way Mechanical Engineer, June, p. 364.
aining **foremen** in leadership. (6 500 words & fig.)

25 725 .33 (.73)
way Mechanical Engineer, July, p. 410.
port on the design of **shops and engine terminals.** 0 words & fig.)

1925 621 .131.2
Railway Mechanical Engineer, July, p. 418.
Report on **locomotive design and construction.** (4 300 words, 1 table & fig.)

1925 621 .338
Railway Mechanical Engineer, July, p. 423.
Report on **electric rolling stock.** (4 200 words.)

1925 625 .246
Railway Mechanical Engineer, July, p. 426.
Committee on **car construction.** (5 200 words & fig.)

1925 625 .245
Railway Mechanical Engineer, July, p. 434.
Report on committee on **tank cars.** (3 400 words.)

1925 625 .251
Railway Mechanical Engineer, July, p. 436.
Report on **brakes and brake equipment.** (1 800 words & fig.)

1925 625 .251
Railway Mechanial Engineer, July, p. 448.
KELLY (J. P.). — Character of **wheel and rail** contact. (4 000 words & fig.)

1925 621 .131.3 (.73)
Railway Mechanical Engineer, July, p. 462.
Tests of Missouri Pacific three-cylinder Mikado. (2 000 words, 1 table & fig.)

1925 621 .132.8
Railway Mechanical Engineer, July, p. 468.
Schneider hydraulic transmission for **Diesel locomotives.** (2 800 words & fig.)

1925 621 .133.3
Railway Mechanical Engineer, August, p. 487.
POPEREV (A. P.). — The evaporation capacity of **locomotive boilers.** (4 000 words & fig.)

1925 625 .214 (.73)
Railway Mechanical Engineer, August, p. 499.
ORR (A. M.). — How to stop **hot box epidemics.** (2 200 words & fig.)

1925 621 .133.3
Railway Mechanical Engineer, August, p. 517.
KOYL (C. H.). — Causes and prevention of pitting in **locomotive boilers.** (2 000 words & fig.)

1925 621 .132.8 (.73)
Railway Mechanical Engineer, September, p. 544.
Mallet locomotives acquired by Great Northern. (1 600 words & fig.)

1925 621 .132.5 (.73)
Railway Mechanical Engineer, September, p. 557.
S. P. and U. P. acquire **three-cylinder 4-10-2 locomotives.** (800 words & fig.)

1925 625 .25
Railway Mechanical Engineer, September, p. 561.
JUNEAU (C. G.). — **Freight car maintenance problems.** (3 200 words & fig.)

1925 621 .39 (.73) & 621 .392 (.73)
Railway Mechanical Engineer, September, p. 580.
Welding in railroad shop practice. (2 600 words, 2 tables & fig.)

Railway Review. (Chicago.)

1925 656 .254 (.73) & 656 .255 (.73)
Railway Review, No. 19, May 9, p. 850.
POST (W. M.). — Train operation by signal indication only. (4 500 words & fig.)

1925 625 .26 (.73)
Railway Review, No. 19, May 9, p. 857.
Effective methods in **car maintenance work.** (2 500 words & fig.)

1925 656 .253 (.73)
Railway Review, No. 20, May 16, p. 890.
Pittsburgh & Lake Erie **tests train control.** (4 800 words & fig.)

1925 621 .335 (.73)
Railway Review, No. 21, May 23, p. 935.
STAPLES (E. I.). — First Virginian **electric locomotive** tested. (1 700 words & fig.)

1925 625 .24 (.73) & 656 .223.2 (.73)
Railway Review, No. 21, May 23, p. 938.
JUNEAU (C. G.). — Some **freight car maintenance** problems. (3 800 words & fig.)

1925 656 .253 (.73)
Railway Review, No. 21, May 23, p. 942.
BAIRD (M. A.). — **Train operation** by signal indication only. (1 200 words & fig.)

1925 625 .11 (.71)
Railway Review, No. 23, June 6, p. 1003.
WICKSTEED (H. W.). — **Proposed Abitibi Southern Ry.** opens new territory. (2 300 words & fig.)

1925 385. (07.13 (.73)
Railway Review, No. 23, June 6, p. 1013.
JUNEAU (C. G.). — How the Milwaukee Road is **training apprentices.** (2 100 words & fig.)

1925 656 .253 (.73)
Railway Review, No. 23, June 6, p. 1023.
HANSON (E.). — **Train operation** by signal indication only. (2 000 words & fig.)

1925 621 .132.5 (.73)
Railway Review, No. 24, June 13, p. 1043.
POWNALL (W. A.). — **Mikado type locomotive** for Wabash Railway. (4 700 words, 1 table & fig.)

1925 625 .26 (.73) & 725 .33 (.73)
Railway Review, No. 24, June 13, p. 1051.
NILSSON (E.). — **Maintaining freight cars** under a cost plus plan. (2 900 words & fig.)

1925 621 .131.2 (.73)
Railway Review, No. 24, June 13, p. 1056.
BAXTER (W. W.). — Developments **in locomotive construction.** (2 700 words & fig.)

1925 625 .212 (.73) & 669 .1 (.7
Railway Review, No. 24, June 13, p. 1066.
VIAL (F. K.). — The unusual story of the **chill** **iron wheel.** (4 400 words.)

1925 625 .212 (.73) & 669 .1 (.7
Railway Review, No. 24, June 13, p. 1070.
RICHARDSON (G. A.). — Valuable facts to kno about **rolled steel wheels.** (3 400 words & fig.)

1925 625 .26 (.7
Railway Review, No. 24, June 13, p. 1075.
NILSSON (E.). — Need of planning in **building a repairing cars.** (3 700 words & fig.)

1925 621 .138.5 (.71) & 621 .9 (.7
Railway Review, No. 24, June 13, p. 1097.
BAXTER (W. W.). — **Locomotive shop practices** Canadian Railways. (2 500 words & fig.)

1925 656 .253 (.7
Railway Review, No. 24, June 13, p. 1107.
SAUNDERS (J. E.). — **Train operation** by sign indication only. (1 700 words & fig.)

1925 625 .2
Railway Review, No. 24, June 13, p. 1112.
CLEGG (W. H.). — **Brake gear design,** installatio and maintenance. (2 200 words & fig.)

1925 625 .246 (.7
Railway Review, No. 25, June 20, p. 1129.
NILSSON (E.). — Proposed design for A. R. standard D. S. **box car.** (4 200 words & fig.)

1925 621 .133.1 (.7
Railway Review, No. 25, June 20, p. 1138.
RETTERER (R. W.). — Back pressure as an inde to **fuel economy.** (5 600 words & fig.)

1925 621 .7 (.7
Railway Review, No. 25, June 20, p. 1150.
RICHARDSON (G. A.). — Interesting processes building **freight cars.** (3 800 words & fig.)

1925 725 .33 (.7
Railway Review, No. 25, June 20, p. 1157.
Passenger car repair shop design and constructio (4 400 words & fig.)

1925 625 .2
Railway Review, No. 25, June 20, p. 1164.
Calculations for single sheated **box car design.** (4 4 words & fig.)

1925 656 .211.4 (.7
Railway Review, No. 26, June 27, p. 1201.
BOYD (G. E.). — **New station** at St. Paul near completed. (2 500 words & fig.)

1925 656 .254 (.7
Railway Review, No. 26, June 27, p. 1214.
ALLEN (G. Y.). — Radio has possibilities in **rai road operation.** (2 200 words & fig.)

925 725 .33 (.73)
lway Review, No. 1, July 4, p. 1.
AXTER (W. W.). — Rock Island builds passenger repair shops. (1 600 words & fig.)

925 621 .138.2
lway Review, No. 1, July 4, p. 10.
Various methods for determining fuel performance. 300 words & fig.)

925 621 .132.3 (.41)
lway Review, No. 1, July 4, p. 17.
AXTER (W. W.). — New locomotives for G. S. & Ry. of Ireland. (1 200 words & fig.)

925 313 .385 (.73) & 51. (08 (.73)
lway Review, No. 2, July 11, p. 41.
VOLFF (L. R.). — Statistical bureau of freight itor's office. (6 500 words & fig.)

925 621 .33 (.73)
lway Review, No. 2, July 11, p. 51.
UTCHER (C. A.). — B. & O. R. R. completes ten Island electrification. (4 500 words & fig.)

925 621 .132.5 (.73)
lway Review, No. 3, July 18, p. 83.
AXTER (W. W.). — Chesapeake & Ohio Mikado e locomotive. (1 100 words & fig.)

925 625 .172 (.73)
lway Review, No. 3, July 18, p. 87.
iling rails and fixtures to prevent corrosion. (1 800 ds & fig.)

925 313 .385
lway Review, No. 3, July 18, p. 101.
LATER (J. E.). — Statistics as an aid to railroad ration. (3 600 words.)

925 621 .33
way Review, No. 4, July 25, p. 126.
eport of Committee on electric rolling stock. (4 200 ds.)

925 621 .131.3 (.73)
way Review, No. 5, August 1, p. 151.
AXTER (W. W.). — Missouri Pacific three cylin- locomotive tests. (3 200 words, 1 table & fig.)

25 725 .36 (.73)
way Review, No. 6, August 8, p. 191.
cust point grain elevator, B. & O. R. R. (3 600 ds & fig.)

25 385 .517.7 (.71)
way Review, No. 6, August 8, p. 199.
YD (G. E.). — C. P. R. section houses have ing appearance. (700 words & fig.)

25 621 .7 (.73)
way Review, No. 7, August 15, p. 227.
LSSON (E.). — How forgings are produced in oad shops. (1 800 words & fig.)

1925 625 .245 (.73)
Railway Review, No. 7, August 15, p. 234.
NILSSON (E.). — Monon receives new composite hopper cars. (1 300 words & fig.)

1925 625 .142.2
Railway Review, No. 7, August 15, p. 236.
GOLTRA (W. F.). — What is the average life of railroad crossties. (1 900 words & fig.)

1925 656 .213 (.73)
Railway Review, No. 8, August 22, p. 265.
Plans improved freight service for Manhattan. (2 100 words & fig.)

1925 624 .32 (.73)
Railway Review, No. 8, August 22, p. 269.
Florida East Coast Railway completes bridge. (1 800 words & fig.)

1925 625 .1 (.73)
Railway Review, No. 8, August 22, p. 273.
BOYD (Geo. E.). — Double tracks for the N. & W. big sandy line. (2 500 words & fig.)

1925 625 .143.3
Railway Review, No. 8, August 22, p. 277.
What causes the silvery oval spots in rails? (1 400 words.)

1925 621 .139 (.73)
Railway Review, No. 8, August 22, p. 286.
TREAT (D. S.). — Employing mechanical aid in shop accounting. (2 700 words & fig.)

1925 621 .132.8 (.485)
Railway Review, No. 9, August 29, p. 301.
NILSSON (E.). — Diesel-electric motor cars are used extensively on Swedish railroads. (4 100 words & fig.)

1925 656 .235.7 (.73)
Railway Review, No. 9, August 29, p. 311.
BOYD (Geo. E.). — Lackawanna R. R. handles mail expeditiously. (1 700 words & fig.)

1925 625 .151. (01
Railway Review, No. 9, August 29, p. 321.
WHITE (R.). — The fundamental principles in switch work. (1 500 words.)

1925 621 .132.5 (.73) & 621 .132.7 (.73)
Railway Review, No. 10, September 5, p. 339.
Baldwin locomotive works delivers new engines. (1 100 words & fig.)

1925 625 .151. (01
Railway Review, No. 10, September 5, p. 347.
WHITE (R.). — The fundamental principles of switch work. (2 200 words & fig.)

1925 621 .33 (.73)
Railway Review, No. 10, September 5, p. 349.
HERR (E. M.). — Sees large future for railway electrification. (2 300 words & fig.)

1925 725 .33 (.73)
Railway Review, No. 10, September 5, p. 354.
MACHAMER (H. W.). — New pumping station shows low operating costs. (2 600 words & fig.)

1925 621 .131.3 (.73)
Railway Review, No. 11, September 12, p. 373.
BAXTER (W. W.). — Boston & Albany tests a 2-8-4 type locomotive. (3 600 words & fig.)

1925 656 .253 (.73)
Railway Review, No. 11, September 12, p. 387.
PFLASTERER (George S.). — Train operation by signal indication only. (1 700 words, 1 table & fig.)

1925 385. (07.13 (.73)
Railway Review, No. 11, September 12, p. 396.
THOMAS (F. W.). — Making railroad mechanics for the future. (1 800 words & fig.)

1925 625 .151 (.73) & 625 .18 (.73)
Railway Review, No. 12, September 19. p. 414.
BAXTER (W. W.). — Lackawanna builds and reclaims frogs and switches. (3 300 words & fig.)

1925 621 .139 (.73) & 625 .18 (.73)
Railway Review, No. 12, September 19, p. 429.
McNEIL (J. C.). — Procedure for material stores accounts payable. (2 200 words & fig.)

1925 621 .13 (09.3 (.73)
Railway Review, No. 13, September 26, p. 459.
BAXTER (W. W.). — A summary of developments in locomotive building. (7 800 words & fig.)

1925 625 .143.1 (.73)
Railway Review, No. 13, September 26, p. 469.
Reading tests a new rail section. (800 words & fig.)

1925 625 .14 (09.3 (.73)
Railway Review, No. 13, September 26, p. 471.
BOYD (G. E.). — How present day track design was developed. (6 800 words.)

1925 625 .23 (09.3 (.73) & 625 .24 (09.3 (.73)
Railway Review, No. 13, September 26, p. 480.
NILSSON (E.). — The development of railroad car equipment. (4 500 words & fig.)

Railway Signaling. (Chicago.)

1925 656 .253 (.73)
Railway Signaling, July, p. 253.
Union Pacific completes train control. (3 600 words & fig.)

1925 656 .256 (.7
Railway Signaling, July, p. 260.
KOLB (E. W.). — A proposed method of adjusti track circuits that saves battery. (3 800 words, 1 ta & fig.)

1925 656 .251 (.7
Railway Signaling, July, p. 265.
B. & O. color-position-light signals. (2 000 wo & fig.)

1925 656 .257 (.49
Railway Signaling, July, p. 268.
LASCELLES (T. S.). — Electro-pneumatic pl at Spiez, Switzerland. (2 200 words & fig.)

1925 625 .258 (.73) & 656 .259 (.
Railway Signaling, July, p. 271.
The development of car retarders. (3 600 wo 1 table & fig.)

1925 656 .254 (.
Railway Signaling, August, p. 293.
BLACK (H. L.). — C. N. Automatic Interloc (900 words & fig.)

1925 656 .253 (.
Railway Signaling, August, p. 296.
G. N. completing main line signaling. (5 000 wo 1 table & fig.)

1925 656
Railway Signaling, August, p. 303.
A comparison of signaling systems. (6 000 words

1925 656 .222 (.
Railway Signaling, August, p. 308.
MANN (B. H.). — A study of the economics freight train movements. (7 000 words & fig.)

1925 656 .253 (
Railway Signaling, September, p. 329.
PEABODY (J. A.). — Continuous train control C. & N. W. (3 000 words & fig.)

1925 656 .25 (
Railway Signaling, September, p. 335.
N. Y. C. shop handles all signal and interlocking pairs. (3 000 words & fig.)

1925 656 .253 (
Railway Signaling, September, p. 342.
O. W. R. & N. train control approval. (7 000 wo

1925 656 .254 (
Railway Signaling, September, p. 347.
Largest railway telegraph office. (3 400 words &

1925 656 .257 (
Railway Signaling, October, p. 367.
Maintenance on C. & N. W. terminals. (5 800 w & fig.)

1925 656 .253 (.73) & 656 .256.3 (
Railway Signaling, October, p. 391.
JACOBS (H. M.). — Automatic substations railway signaling and train control. (4 400 words &

In Italian.

I lavori pubblici. (Roma.)

1925 **625 .1 (09.1 (.45)**

lavori pubblici, 1° de novembre, p. 35.

La **ferrovia Livorno-Vada.** (2 400 parole & fig.)

Rivista delle comunicazioni ferroviarie. (Rome.)

1925 **656 .212.5**

Riv. delle comunicazioni ferrov., n° 17, 1° sett., p. 19.

Voti del Congresso ferroviario internazionale di Londra. (1 600 parole.)

1925 **725 .31 (.45)**

Riv. delle comunicazioni ferrov., 1 ottobre, p. 17.

CALMA (E.). — La nuova **stazione centrale di Milano.** (3 000 parole & fig.)

1925 **621 .33 (.45)**

Riv. delle comunicazioni ferrov., n° 20, 15 ottobre, p. 15.

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BURTT (Philip), member of the Council of the Institute of Transport and formerly Deputy General Manager of the N. E. R.

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1925 62. (01 & 669. (02

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1925 621 .13 (09.3 (.42)

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Practical steam, hot water and vapor heating and ventilation.

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Poor's railroad section, 1925.

New York City, Poor's publishing Company. (8 1/2 × 12 1/2 inches), 1 704 pages & maps. (Price : $15.00.)

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1925 621 .134.3 (02

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Elesco locomotive superheaters. Instructions for installation, operation, maintenance, repairs.

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TROWBRIDGE (Douglas S.), Sc. M., C. E., assistant professor of civil engineering New York University.

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DUMAS (P.). — **Electrification des voies ferrées d'intérêt local.** (1 900 mots.)

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GOTTELAND (J.). — Les hangars d'avions de Villacoublay. **Deux voûtes en ciment armé de 55 mètres de portée.** (4 400 mots & fig.)

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1925 621 .131

Arts et Métiers, octobre, p. 393.

VETILLARD (E.). — Considérations générales s les **locomotives.** (3 800 mots & fig.)

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1925 62. (

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1925 385. (01
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POHER (E.). — **Le rôle des chemins de fer dans la** roduction agricole française. (4 300 mots & fig.)

Bulletin technique de la Suisse romande. (Vevey.)

1925 621 .87 (.494)
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1925 62. (01
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CHAUDY (F.). — **La statique grapho-algébrique et** a méthode des segments appliquée au calcul des cadres ectangulaires fermés. (1 400 mots & fig.)

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1926 62. (01
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1926 721 .9
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1926 625 .234
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LEFÈVRE. — Note sur un nouveau **poste d'enclenchement électro-mécanique,** suivie d'une note sur les enclenchements par cylindres d'itinéraires dans les postes Saxby. (6 700 mots & fig.)

1926 385 .113 (.44)
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1926 621 .131.3 (.73)
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1925 621 .33 (.675)
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MESSIN (G.). — Le projet d'**électrification du Chemin de fer du Congo.** (4 500 mots, 1 tableau & fig.)

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1925 621 .135.2 & 625 .214
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MARCEL (H.). — Une idée nouvelle pour le **graissage des fusées des chemins de fer.** L'isothermos. (1 300 mots & fig.)

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BLOCH (R.). — **Les chemins de fer français** et les exportations de produits agricoles. (5 400 mots.)

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1925 669 .1

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1925 625 .214 (.43)

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BUHLE. — **Timken-Rollenlager** im Eisenbahnbetrieb und Förderwesen. (2 000 Wörter u. Abb.)

1925 621 .133.1 (.43)

Glasers Annalen, Heft 12, 15. Dezember, S. 225.

NORDMANN. — **Lokomotivfeuerung mit Braunkohlenbriketts** unter besonderer Berücksichtigung der Funkenfängerfrage. (4 500 Wörter u. 2 Tabellen.)

1925 621 .132.6

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RENHOLM (H.). — Die neuen **IDIE Lokomotiven** der Finnischen Staatseisenbahnen. (3 400 Wörter u. Abb.)

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1925 625 .3 (.6

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Descending the Great Rift Valley in Equatorial Ea Africa. (1 800 words & fig.)

1925 385. 4 (.54) & 385 .587 (.5

Bengal Nagpur Railway Magazine, December, p. 41.

Mr. Ford's methods of **railway administration.** (3 4 words.)

1925 656 .2

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Automatic train stopping devices. (2 400 words & fig

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1925 621 .33 (09.1 (.43

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Vienna Stadtbahn electrification opened. (4 900 wor & fig.)

1925 621 .39 (.7

Electric Railway Journal, No. 25, December 19, p. 107

CANDY (A. M.). — **Arc welding** reduces maint nance costs. (1 400 words & fig.)

1925 621 .33 (.73) & 625 .4 (.7

Electric Railway Journal, No. 26, December 26, p. 11

ELLIOTT (C. A.). — Pacific electric opens $4 000 0 **subway and terminal in Los Angeles.** (450 wor & fig.)

1925 621 .336 (.7

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Concrete trolley arches on D., T. & I. (1 400 wor & fig.)

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1925 621 .86 (.4

Engineer, No. 3640, October 2, p. 358.

Twelve-ton electric transporter at Middlesbroug (1 200 words & fig.)

1925 621 .132.5 (.7

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POULTNEY (E. C.). — Two remarkable **locom tives.** (3 300 words, 1 table & fig.)

1925 621 .132.8 (.7

Engineer, No. 3643, October 23, p. 430.

Diesel-electric rail cars in Canada. (2 200 wor & fig.)

1925 77 .

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WOODRUFF (B. J.) & NELLES (D. H.). — Stere **photo-grammetric surveying.** (2 700 words & fig.)

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gineer, No. 3644, October 30, p. 456.
-million gallon covered service reservoir at Bushey
th. (2 000 words & fig.)

925 385. (07.11
gineer, No. 3645, November 6, p. 493.
he training of engineers. (3 200 words.)

925 385. (09.1 (.42)
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SPINALL (Sir John A. F.). — Some railway notes
and new. (4 500 words & fig.)

925 621 .39 (.42)
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merican locomotive developments. (1 400 words.)

925 621 .87 (.42)
gineer, No. 3647, November 20, p. 561.
0-ton steam Titan crane. (600 words & fig.)

925 621 .83
gineer, No. 3648, November 27, p. 589.
RCUTT (H. F. L.). — Characteristics and uses of
und gears. (2 300 words & fig.)

925 621 .13
gineer, No. 3650, December 11, p. 641.
he steam locomotive. (1 200 words.)

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nderhung travelling jib crane. (800 words & fig.)

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TROMEYER (C. E.). — Experiments on strains in
lers. (3 000 words, 5 tables & fig.)

925 621 .133.1 (.42)
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OLCROFT (H.). — Locomotive coal trials on the
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Mechanical couplers for the Indian broad-gauge rail-
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926 621 .132.1
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926 385. (09.1 (.42)
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1925 625 .143.2 (.44)
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French rail specification. (1 600 words.)

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Portable electric locomotive hoists. (1 000 words & fig.)

1925 62. (01 & 669
Engineering, No. 3124, November 13, p. 614.
TAPSELL (H. J.). — Mechanical tests at high temperatures on a nonferrous alloy of nickel and chromium. (1 900 words, 4 tables & fig.)

1925 669 .1 & 691
Engineering, No. 3125, November 20, p. 657.
HATFIELD (W. H.). — Modern developments in steels resistant to corrosion. (4 200 words, 11 tables & fig.)

1925 624. (01 & 625 .13
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MITCHELL (C. G.) & CHETTOE (C. S.). — The strengthening of bridges. (5 300 words & fig.)

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Baguley-Clarkson locomotive for the Egyptian Delta Light Railway. (1 900 words & fig.)

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SMITH (D. M.). — The transverse vibration of uniform beams. (3 000 words & fig.)

1926 625 .252 (.42)
Engineering, No. 3131, January 1, p. 9.
Compound-leverage hand-brake for railway wagons. (1 500 words & fig.)

1926 621 .132.8 (.73)
Engineering, No. 3131, January 1, p. 25.
Motor rail car developments in the United States. (2 500 words & fig.)

1926 621 .335 (.485)
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Electric locomotives for the Lapland Railway. (2 300 words & fig.)

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BENGOUGH (C. F.). — High-level bridge, Newcastle-upon-Tyne : underpinning and repair of foundations of river piers. (1 500 words.)

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LLOYD (H. G.). — A method of testing concrete blocks. (2 200 words & fig.)

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Engineering, No. 3133, January 15, p. 85.

Universal horizontal **testing machine.** (1 300 words & fig.)

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Engineering News-Record, No. 16, October 15, p. 620.

Building the Amaga railway extension in Colombia. (3 900 words & fig.)

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WELSCH (W. F.). — **Predetermining concrete strength** on park bridges. (1 500 words & 1 table.)

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Furnishing **concrete** by a strength specification. (3 200 words, 1 table & fig.)

1925 625 .142.4 (.73)

Engineering News-Record, No. 18, October 29, p. 708.

Experiments with **concrete ties.** (400 words & fig.)

1925 624 .63 (.73)

Engineering News-Record, No. 18, October 29, p. 722.

SEILER (J. F.). — Continuous-girder **bridges of concrete.** (3 000 words, 3 tables & fig.)

1925 625 .12

Engineering News-Record, No. 19, November 5, p. 742.

TERZAGHI (C.). — Principles of **soil mechanics :** I. Phenomena of cohesion of clay. (4 600 words & fig.)

1925 624 .63 (.73)

Engineering News-Record, No. 19, November 5, p. 750.

RABE (W. H.). — **Concrete arch bridge** of unusual form and details. (1 400 words & fig.)

1925 721 .9 (.73)

Engineering News-Record, No. 20, November 12, p. 786.

EGELHOFF (R. F.). — A manual for **building and operating sliding forms.** (5 700 words & fig.)

1925 624 .8 (.73)

Engineering News-Record, No. 21, November 19, p. 826.

Double-leaf **bascule bridge** over canal at Seattle. (1 200 words & fig.)

1925 624 .7 (.73)

Engineering News-Record, No. 21, November 19, p. 840.

Concrete cantilever bridge built of high early strength cement. (500 words & fig.)

1925 621 .138.2 (.73)

Engineering News-Record, No. 22, November 26, p. 867.

Contract methods in **railroads coal stripping operations.** (1 800 words & fig.)

1925 625 .13 (.73)

Engineering News-Record, No. 23, December 3, p. 902.

Lining procedure in Holland **vehicular tunnel.** (3 900 words & fig.)

1925 656 .212.6 (

Engineering News-Record, No. 23, December 3, p.

Pennsylvania R. R. car-dumper for **loading coal ships.** (600 words & fig.)

1925 624 .51 (

Engineering News-Record, No. 23, December 3, p.

California **suspension bridge** in service since 1 (600 words & fig.)

1925 691 (

Engineering News-Record, No. 23, December 3, p.

MACKENZIE (C. J.). — Some recent studies effect of **alkali on concrete.** (2 000 words.)

1925

Engineering News-Record, No. 25, December 17, p.

Precast concrete units for railway structures. (2 words.)

1925 625 .1

Engineering News-Record, No. 26, December 24, p. 1

Life of ties measured by new method. (750 w & fig.)

1925 624 .52 (

Engineering News-Record, No. 27, December 31, p. 1

IBSEN (H.). — Demolition of **Niagara falls ca lever bridge.** (5 200 words & fig.)

Great Western Railway Magazine. (London

1925 625 .242 (

Great Western Ry. Magazine, November, p. 410.

LAMPITT (R. E.). — Larger **mineral wagons.** (words & fig.)

1925 656 .212 (

Great Western Ry. Magazine, December, p. 451.

New **goods station at Temple Meads,** Bristol. (words & fig.)

Institution of Engineers, Australia.

1925 62. (01 & 72

Institution of Engineers, Australia, No. 6, April, p

STOBIE (J. C.). — A design for light **concrete poles.** (2 600 words & fig.)

Journal of the Institute of Transport. (Lond

1925 388

Journal of the Institute of Transport, November, p

JACKSON (W.). — **Electric and petrol transpo passengers** in America. (12 000 words & fig.)

1925 385 .3

Journal of the Institute of Transport, November, p

BILBROUGH (G. F.). — The **Railways Act,** (10 000 words.)

1925 385. (09.3

Journal of the Institute of Transport, December,

BELL (R.). — **A hundred years of railway lopment.** (15 000 words.)

1925 656 .222.5 (.42)
rnal of the Institute of Transport, December, p. 96.
LLEN (C. J.). — British main line passenger train vices — their characteristics and possibilities. (8 800 rds & fig.)

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comotive, Firemen & Enginemen's Magazine. (Cleveland [Ohio].)

1926 625 .2 (01
. Firemen & Enginemen's Mag., January, p. 51.
ELLY (J. P.). — Character of wheel and rail con-t. (3 500 words & fig.)

Mechanical Engineering. (New York.)

1925 625 .235 (.73)
chanical Engineering, November, p. 875.
cDONNELL (M. E.). — The rustproofing of mate-ls. (4 400 words & 1 table.)

1925 621 .131.3 (.73)
chanical Engineering, November, p. 881.
RY (L. H.). — The locomotive testing plant and influence on steam-locomotive design. (5 300 rds, 2 tables & fig.)

1925 621 .134.5 & 625 .214
chanical Engineering, November, p. 887.
UGUID (J.). — Lubricants and lubrication. (10 000 rds.)

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925 621 .133.7
chanical Engineering, November, p. 909.
EHRMAN (A. S.). — Boiler-feedwater purification. 00 words.)

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925 656 .212.6 (.73)
hanical Engineering, Mid-November, p. 973.
AMPBELL (F. D.). — Materials-handling problems their solution. (4 500 words & fig.)

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925 51. (08
hanical Engineering, Mid-November, p. 1019.
EWARD (H. L.). — Graphical methods of calcula-n. (5 200 words & fig.)

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925 621 .99 & 669 .1
hanical Engineering, Mid-November, p. 1034.
OOD (W. P.). — Bolts for use in power-plant struction. (2 600 words, 2 tables & fig.)

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925 621 .43
hanical Engineering, Mid-November, p. 1075.
OSS (S. A.). — Centrifugal compressors for Diesel ines. (7 800 words & fig.)

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926 669
hanical Engineering, January, p. 8.
FFRIES (Z.). — Engineering and science in the al industry. (9 500 words & fig.)

1926 621 .83 (.73)
Mechanical Engineering, January, p. 27.
EATON (G. M.). — Normal pitch the index of gear performance. (6 200 words & fig.)

1926 621 .83 (.73)
Mechanical Engineering, January, p. 33.
Some comparative wear experiments on cast-iron gear teeth. (1 500 words & fig.)

1926 621 .131.3 (.73)
Mechanical Engineering, January, p. 36.
LIPETZ (A. I.). — The locomotive testing plant. (3 500 words.)

Modern Transport. (London.)

1926 625 .13 (.42)
Modern transport, No. 356, January 9, p. 11.
Demolition of Chevet tunnel and widening of L. M. S. R. main lines. (1 300 words & fig.)

1926 385. (09.1 (.68)
Modern transport, No. 357, January 16, p. 3.
Railway progress in South Africa. (4 100 words & fig.)

1926 621 .132.8 (.68)
Modern transport, No. 357, January 16, p. 13.
Locomotive developments, Union of South Africa Railways. (1 000 words & fig.)

Proceedings, American Society of Civil Engineers. (New York.)

1926 721 .3 (01 & 721 .9 (01
Proceed. Amer. Soc. Civil Eng., January, p. 3.
ZESIGER (A. W.) & AFFELDT (E. J.). — Stresses in helically reinforced concrete columns. (8 000 words, 1 table & fig.)

1926 62. (01 & 624 .2 (01
Proceed. Amer. Soc. Civil Eng., January, p. 122.
Moments in restrained and continuous beams by the method of conjugate points. (6 200 words & fig.)

1926 691 (.73)
Proceed. Amer. Soc. Civil Eng., January, p. 164.
SMITH (G. E. P.). — The effect of moisture on concrete. (1 200 words & fig.)

Railway Age. (New York.)

1925 656 .213 (.73)
Railway Age, No. 19, November 7, p. 839.
Pennsylvania builds large car dumper in record time. (3 400 words & fig.)

1925 385 .22 (.73)
Railway Age, No. 19, November 7, p. 845.
Regulation of competing rail and water carriers. (2 400 words.)

1925 **625 .235 (.73)**
Railway Age, No. 19, November 7, p. 849.
McDONNELL (M. E.). — Rustproofing of **steel materials.** (3 300 words, 1 table & fig.)

1925 **625 .1 (.73)**
Railway Age, No. 20, November 14, p. 886.
Southern Pacific builds important line in Oregon. (3 000 words & fig.)

1925 **621 .33 (.73)**
Railway Age, No. 20, November 14, p. 899.
MARSHALL (E.). — **Great Northern electrification.** (2 800 words & fig.)

1925 **625 .244 (.73)**
Railway Age, No. 20, November 14, p. 909.
Efficiency of short **refrigerator cars.** (1 800 words.)

1925 **725 .33 (.73)**
Railway Age, No. 21, November 21, p. 935.
Pennsylvania reconstructs Juniata shops on a large scale. (1 700 words & fig.)

1925 **621 .139 (.73) & 625 .27 (.73)**
Railway Age, No. 21, November 21, p. 947.
Denver & Rio Grande Western **cuts material handling costs.** (2 400 words & fig.)

1925 **621 .33 (.73)**
Railway Age, No. 21, November 21, p. 951.
Electrification of passenger service. (2 900 words & fig.)

1925 **625 .243 (.73)**
Railway Age, No. 21, November 21, p. 957.
D. L. & W. acquires **double sheated 55-ton box cars.** (1 200 words & fig.)

1925 **385. (01 (.73)**
Railway Age, No. 23, December 5, p. 1029.
GRAY (C. R.). — An optimistic view of the **railroad situation.** (4 300 words.)

1925 **624 .1 & 625 .13**
Railway Age, No. 23, December 5, p. 1033.
BOUILLON (A. M.). — **Is winter work** profitable? (3 700 words & fig.)

1925 **621 .133.8 (.73) & 656 .251 (.73)**
Railway Age, No. 23, December 5, p. 1043.
FOLEY (A. L.). — A study of **locomotive whistles.** (4 900 words & fig.)

1925 **625 .14 (.73)**
Railway Age, No. 24, December 12, p. 1083.
ALFRED (F. H.) & CHIPMAN (P.). — A design for **permanent track construction.** (3 600 words & fig.)

1925 **656 .2**
Railway Age, No. 24, December 12, p. 1089.
SILLCOX (L. K.). — The **economics of transportation service.** (6 300 words.)

1925 **625 .244 (.**
Railway Age, No. 24, December 12, p. 1099.
ALQUIST (P.). — D. L. & W. fruit **refrigera cars.** (900 words & fig.)

1926 **313 .385 (.**
Railway Age, No. 1, January 2, p. 30.
PARMELEE (J. H.). — A review of **railway op tions in 1925.** (10 000 words, 10 tables & fig.)

1926 **313 : 625 (.**
Railway Age, No. 1 January 2, p. 56.
STEEL (D. A.). — **1925 supply and equipment c** show marked stability. (3 500 words, tables & fig.)

1926 **621 .132.1 (**
Railway Age, No. 1, January 2, p. 65.
KRAEGER (F. W.). — **Locomotive orders in 1** (1 100 words, 2 tables & fig.)

1926 **625 .24 (**
Railway Age, No. 1, January 2, p. 73.
KRAEGER (F. W.). — **Freight car orders in 1** (1 000 words, 3 tables & fig.)

1926 **625 .23 (**
Railway Age, No. 1, January 2, p. 83.
KRAEGER (F. W.). — **Passenger car orders in 1** (800 words, 3 tables & fig.)

1926 **621 .335 (**
Railway Age, No. 2, January 9, p. 168.
MURPHY (T. H.). — The Reading **gas-electric car.** (2 400 words & fig.)

1926 **621 .139 (.73) & 625 .18 (**
Railway Age, No. 2, January 9, p. 171.
New Pennsylvania scrap dock saves $100 000 per y (2 600 words & fig.)

1926 **625 .142.2 (.73) & 625 .173 (**
Railway Age, No. 2, January 9, p. 175.
ROBINSON (E. F.). — **Systematic protection of** effects marked economies. (5 300 words, 1 table &

1926 **656 .253 (**
Railway Age, No. 2, January 9, p. 181.
Train control installations approved. (4 300 wo

1926 **385 .11 (**
Railway Age, No. 2, January 9, p. 187.
SLATER (J. E.). — Forecasting **railway reve** (4 400 words & fig.)

1926 **656 .28 (01 (**
Railway Age, No. 2, January 9, p. 197.
Annual report of the Bureau of **locomotive ins tion.** (1 800 words, 3 tables & fig.)

Railway Engineer. (London.)

1925 **625 .216 (.42) & 625 .232**
Railway Engineer, October, p. 355.
Articulated express passenger trains, Great We Railway. (400 words & fig.)

1925 656 .256
ilway Engineer, October, p. 360.
TATTERSALL (A. E.). — **Direct-current track cir-**its and the transient track circuit. (2 700 words fig.)

1925 656 .211 (.42) & 656 .212 (.42)
ilway Engineer, November, p. 373.
Aylesbury joint station reconstruction. (2 400 words fig.)

1925 621 .392
ilway Engineer, November, p. 380.
Maintenance of **railway machinery.** (1 400 words fig.)

1925 621 .33 (.42)
ilway Engineer, November, p. 383.
The world's greatest **suburban electrification.** (4 800 ords & fig.)

1925 621 .9 (.42)
ilway Engineer, November, p. 392.
Some new **machine tools** at North Road works, Dar-gton, London & North Eastern Railway. (3 400 words fig.)

1925 621 .131.3 (.54) & 621 .132.8 (.54)
ilway Engineer, November, p. 399.
Articulated locomotive tests in India and Burma. 500 words & fig.)

1925 656 .256
ilway Engineer, December, p. 431.
Direct-current transient **track-circuits** for special cations. (700 words & fig.)

1925 621 .132.5 (.73) & 621 .132.8 (.73)
ilway Engineer, December, p. 432.
Mallet locomotive for heavy freight service. (500 ords & fig.)

1925 621 .133. (01
ilway Engineer, December, p. 433.
The **locomotive condenser.** (1 000 words & fig.)

1925 621 .132.8 & 621 .165
ilway Engineer, December, p. 435.
DARLING (C. S.). — **Steam turbine locomotives.** 500 words, 4 tables & fig.)

1926 385. (07.12 (.44) & 385 .586 (.44)
ilway Engineer, January, p. 7.
CHOUARD (M.). — The **training of railway appren-**es. (3 400 words & fig.)

1926 621 .132.8 (.68)
ilway Engineer, January, p. 20.
« **Modified Fairlie** » locomotive, South African Go-rnment Railways. (350 words & fig.)

1926 625 .143.3
Railway Engineer, January, p. 21.
DANCASTER (E. A.). — An examination into the causes of the **failure of steel rails.** (3 300 words & fig.)

1926 624 .2 & 721 .9
Railway Engineer, January, p. 28.
Expansion joints in **steelwork.** (4 300 words & fig.)

Railway Engineering & Maintenance. (Chicago.)

1925 624 .1 (.73) & 691 (.73)
Railway Engineering & Maintenance, October, p. 383.
BOUILLON (A. M.). — **Building bridge masonry** in winter. (3 500 words & fig.)

1925 625 .14 (06 (.73)
Railway Engineering & Maintenance, October, p. 389.
Roadmasters hold forty-third annual convention at Kansas City. (31 000 words & fig.)

1925 625 .142 (.73) & 625 .173 (.73)
Railway Engineering & Maintenance, Nov., p. 433.
SILLS (J. M.). — Frisco studies various methods of making **tie renewals.** (3 900 words, 3 tables & fig.)

1925 625 .143.3
Railway Engineering & Maintenance, Nov., p. 438.
Are **rail failures** confined to American roads? (3 700 words & fig.)

1925 691
Railway Engineering & Maintenance, Nov., p. 458.
The use of precast **concrete units.** (3 200 words & fig.)

1925 625 .151 (.73)
Railway Engineering & Maintenance, Dec., p. 481.
NOLAND (C. J.). — **Track work** in Chicago Union Station is unusually heavy. (2 500 words & fig.)

1925 691 (.73) & 721 .9 (.73)
Railway Engineering & Maintenance, Dec., p. 485.
BOUILLON (A. M.). — Heating of aggregates ne-cessary when **placing concrete in winter.** (2 600 words & fig.)

1925 625 .123 (.73)
Railway Engineering & Maintenance, December, p. 490.
New type of pipe solves **drainage problem in yard.** (1 300 words & fig.)

1925 625 .141 (.73) & 625 .172 (.73)
Railway Engineering & Maintenance, December, p. 495.
Pennsylvania uses **vacuum cleaner on stone ballast.** (900 words & fig.)

1925 625 .144
Railway Engineering & Maintenance, December, p. 497.
Laying rail in the winter. (1 900 words.)

Railway Gazette & Railway News. (London.)

1925 656 .25
Railway Gazette & News, No. 16, October 16, p. 454.
TATTERSALL (A. E.). — The economic aspect of **signalling.** (2 900 words & fig.)

1925 625 .232
Railway Gazette & News, No. 16, October 16, p. 457.
New rolling stock for the International Sleeping Car Company. (1 000 words & fig.)

1925 621 .132.8 (.68)
Railway Gazette & News, No. 16, October 16, p. 461.
« Modified Fairlie » locomotive, South African Government Railways. (300 words & fig.)

1925 656 .213 (.42)
Railway Gazette & News, No. 17, October 23, p. 482.
A notable **brewery railway system.** (4 000 words & fig.)

1925 656 .235 (.44)
Railway Gazette & News, No. 17, October 23, p. 491.
Railway rates in France. (4 200 words & 1 table.)

1925 656 .235 (.489)
Railway Gazette & News, No. 18, October 30, p. 514.
Railway rates in Denmark. (2 900 words, 4 tables & fig.)

1925 385. (09.1 (.94)
Railway Gazette & News, No. 18, October 30, p. 519.
Commonwealth **Railways of Australia.** (4 400 words, 3 tables & fig.)

1925 621 .132.8 (.71) & 621 .335 (.71)
Railway Gazette & News, No. 18, October 30, p. 535.
Diesel-electric rail cars in Canada. (800 words & fig.)

1925 656 .235 (.485)
Railway Gazette & News, No. 19, November 6, p. 554.
Railway rates in Sweden. (2 200 words & 1 table.)

1925 385. (09.1 (.944)
Railway Gazette & News, No. 19, November 6, p. 557.
The **New South Wales Government Railways.** (14 500 words, 4 tables & fig.)

1925 656 .222 (.42)
Railway Gazette & News, No. 19, November 6, p. 589.
Metropolitan and London & North Eastern **new line** to Watford. (2 700 words & fig.)

1925 656 .235 (.481)
Railway Gazette & News, No. 20, November 13, p. 614.
Railway rates in Norway. (1 400 words, 5 tables & fig.)

1925 385. (09.1 (.943)
Railway Gazette & News, No. 20, November 13, p. 617.
The **Queensland Government Railways.** (7 000 words, 4 tables & fig.)

1925 656 .212.6 (.42+.73) & 656 .213 (.42+
Railway Gazette & News, No. 21, November 20, p.
BULKELEY (G.). — Speed and economy in **shipment of export coal.** (1 600 words & fig.)

1925 385. (09.1 (.
Railway Gazette & News, No. 21, November 20, p.
The **South Australian Government Railways.** (
words, 3 tables & fig.)

1925 385. (09.1 (.
Railway Gazette & News, No. 22, November 27, p.
The **Tasmanian Government Railways.** (2 800 w
tables & fig.)

1925 656 .254
Railway Gazette & News, No. 22, November 27, p.
THORROWGOOD (W. J.). — Inner London
matic telephone system, Southern Railway. (
words & fig.)

1925 385. (09.1 (.
Railway Gazette & News, No. 23, December 4, p.
The **Western Australian Government Railv**
(6 600 words, 2 tables & fig.)

1925 385. (09.1 (.
Railway Gazette & News, No. 24, December 11, p.
The **New Zealand Government Railways.** (
words, 2 tables & fig.)

1925 621 .138.5
Railway Gazette & News, No. 25, December 18, p.
PEZEU (J.). — Organisation of a large F
locomotive depot. (1 000 words & fig.)

1925 621 .9
Railway Gazette & News, No. 25, December 18, p.
New **woodworking machines** for railway works
(1 300 words & fig.)

1925 656 .211.4
Railway Gazette & News, No. 26, December 25, p
New Buenos Ayres terminal, Buenos Ayres
Southern Railway. (600 words & fig.)

1925 621 .132.3 (.8) & 621 .132.8
Railway Gazette & News, No. 26, December 25, p
New **locomotives for South America,** built by
Peacock & Co. Ltd. (600 words & fig.)

1926 625 .162
Railway Gazette & News, No. 1, January 1, p. 8
Electrically-operated crossing gates at Sle
L. N. E. R. (450 words & fig.)

1926 621 .132.3 (.942) & 621 .132.5
Railway Gazette & News, No. 1, January 1, p. 12
New locomotives for the South Australian Rail
(1 600 words & fig.)

1926 625 .245 (.42)
ilway Gazette & News, No. 1, January 1, p. 14.
New special freight vehicles, L. M. S. R. (300 words fig.)

1926 656 .251 (.42)
ilway Gazette & News, No. 1, January 1, p. 15.
New permanent-way and signalling arrangements, lfast station yard, London Midland & Scottish Rail-y, Northern Counties Committee. (750 words & fig.)

1926 385. (09.1 (.945)
ilway Gazette & News, No 2, January 8, p. 41.
The Victorian Government Railways. (14 300 words, able & fig.)

1926 621 .132.6 (.42)
ilway Gazette & News, No. 3, January 15, p. 89.
New tank engines, London & North Eastern Railway. 0 words & fig.)

1926 625 .232 (.82)
ilway Gazette & News, No. 3, January 15, p. 93.
Official saloon coach, Buenos Ayres & Pacific Rail-y. (1 100 words & fig.)

1926 621 .131.3 (.54) & 621 .132.8 (.54)
ilway Gazette & News, No. 3, January 15, p. 94.
Articulated locomotive tests in India. (1 000 words fig.)

1926 621 .132.6 (.42)
ilway Gazette & News, No. 3, January 15, p. 95.
New three-cylinder express tank engine, Southern ilway. (400 words & fig.)

Railway Magazine. (London.)

1925 385. (09.1 (.51)
ilway Magazine, December, p. 485.
VRIGHT (H. T.). — The Cheng Tai Railway, China. 300 words & fig.)

1925 621 .132.3 (.944)
ilway Magazine, December, p. 494.
ood work by 4-6-0 passenger engines, New South les Government Railways. (1 200 words & fig.)

1926 656 .211 (.42)
lway Magazine, January, p. 1.
AIRNS (J. F.). — Notable railway stations and ir traffic. Waverley, Edinburgh, L. N. E. R. (7 300 rds & fig.)

926 656 .222.1 (.42)
lway Magazine, January, p. 25.
LLEN (C. J.). — British locomotive practice and formance. (6 300 words, 9 tables & fig.)

926 656 .211.7 (.42)
lway Magazine, January, p. 43.
lyde rail and steamer services. (4 700 words & fig.)

Railway Mechanical Engineer. (New York.)

1925 385 .57
Railway Mechanical Engineer, November, p. 681.
DAY (Z. E.). — The foreman and his responsibility. (1 000 words.)

1925 621 .335 (.71)
Railway Mechanical Engineer, November, p. 682.
Canadian National builds nine motor rail cars. (3 800 words, 1 table & fig.)

1925 625 .246 (.73) & 698 (.73)
Railway Mechanical Engineer, November, p. 693.
Testing paint by the removed film method. (4 300 words, 1 table & fig.)

1925 625 .26 (.73)
Railway Mechanical Engineer November, p. 699.
BROWN (A. B.). — Southern increases its car repair facilities. (3 000 words & fig.)

1925 625 .243 (.73)
Railway Mechanical Engineer, November, p. 705.
ALQUIST (P.). — Double sheated 55-ton box cars for the D. L. & W. (1 200 words & fig.)

1925 621 .138.5 (.73)
Railway Mechanical Engineer, November, p. 713.
Some impressions of Burnham locomotive shop. (3 900 words & fig.)

1925 621 .334 (.73)
Railway Mechanical Engineer, November, p. 719.
PAYNE (H. J.). — Electric trucks in the locomotive repair shop. (1 700 words & fig.)

1925 621 .131.3 (.73)
Railway Mechanical Engineer, December, p. 743.
FRY (L. H.). — Locomotive test plants — Their influence on design. (4 000 words & fig.)

1925 621 .136 (.73)
Railway Mechanical Engineer, December, p. 747.
Rock Island remodels Vanderbilt type tenders. (1 200 words & fig.)

1925 625 .235 (.73)
Railway Mechanical Engineer, December, p. 757.
McDONNELL (M. E.). — Rustproofing of steel materials. (3 000 words & fig.)

1925 625 .26 (.73)
Railway Mechanical Engineer, December, p. 769.
E. J. & E. steel car shop at Joliet. (2 800 words & fig.)

1925 621 .133.2 (.73)
Railway Mechanical Engineer, December, p. 774.
FITZ SIMMONS (E. S.). — Inspection of flexible staybolts. (2 600 words & fig.)

1925 621 .85 (.73)
Railway Mechanical Engineer, December, p. 777.
Effective shop jigs and devices. (1 500 words & fig.)

Railway Review. (Chicago.)

1925 625 .113 (.73)
Railway Review, No. 14, October 3, p. 507.
BOYD (G. E.). — Central of Georgia Railway improves **busy line.** (4 200 words & fig.)

1925 625 .17
Railway Review, No. 14, October 3, p. 518.
WHITE (R.). — The fundamental principles of **switch work.** (1 200 words & fig.)

1925 691
Railway Review, No. 14, October 3, p. 527.
MILLER (R. M.). — The cause and how to remedy laitance in **concrete.** (3 700 words & fig.)

1925 625 .142.2
Railway Review, No. 14, October 3, p. 531.
How to inspect and identify **ties for renewal.** (1 400 words.)

1925 625 .26 (.73)
Railway Review, No. 15, October 10, p. 548.
The straight line or spot system of **car repairs.** (1 900 words & fig.)

1925 621 .138.1 (.73)
Railway Review, No. 15, October 10, p. 568.
Grating protects **ash pits.** (300 words & fig.)

1925 624 .52 (.73)
Railway Review, No. 16, October 17, p. 583.
WELTY (H. T.). — **Castleton bridge** is monumental structure. (5 300 words & fig.)

1925 621 .132.5 (.73)
Railway Review, No. 17, October 24, p. 629.
BAXTER (W. W.). — Simple **articulated locomotives** for G. N. Ry. (3 200 words & fig.)

1925 621 .133.7
Railway Review, No. 18, October 31, p. 669.
BARDWELL (R. C.). — **Treated water** increases locomotive efficiency. (3 000 words.)

1925 621 .132.8 (.71) & 621 .335 (.71)
Railway Review, No. 19, November 7, p. 689.
BAXTER (W. W.). — Canadian National develops **oil-electric car.** (4 400 words & fig.)

1925 625 .26 (.73)
Railway Review, No. 19, November 7, p. 700.
STARR (F. A.). — Classifying **repairs of freight equipment.** (3 600 words & fig.)

1925 621 .132.7 (.73)
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Les ch. de fer et les tramw., février, p. 31.

Disposition nouvelle de **ligne aérienne désaxée.** mots & fig.)

L'Industrie des voies ferrées et des transp automobiles. (Paris.)

1925 625 .614 (

L'Ind. voies ferrées et transp. autom., nov., p. 49

PALANCHON (G.). — Le contrôle rapide de l'é sage électrique dans les réseaux de tramways à l' d'un train d'essais. (2 500 mots & fig.)

1925 621 .14

L'Ind. voies ferrées et transp. autom., nov., p. 501

BOËS. — Etude historique de la **traction sur r par accumulateurs.** (2 500 mots & fig.)

1925 625

L'Ind. voies ferrées et transp. autom., nov., p. 519.

LESAGE. — **Appareils de traversée à niveau.** mins de fer, Tramways. (1 600 mots & fig.)

1925 656 .25

L'Ind. voies ferrées et transp. autom., décembre, p.

GUERY (F.). — La **signalisation** sur les lignes tropolitaines. (9 800 mots, 2 tableaux & fig.)

1925 656

L'Ind. voies ferrées et transp. autom., décembre, p.

CAHEN (M.). — Note sur l'emploi du **Dispatc System** présentée à la III° assemblée générale t nique (Lyon, 22-24 octobre 1925). (5 800 mots &

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MARIAGE (P.). — Moyens propres à assure régularité de **l'exploitation sur les lignes de tramw** (5 500 mots & fig.)

1925 621

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LEBLOND (A.). — Améliorations apportées à **tretien des moteurs de traction** et des compresseur à l'appareillage. (10 000 mots, 8 tableaux & fig.)

1925 621

L'Ind. voies ferrées et transp. autom., décembre, p.

CALLOT. — Note sur le **graissage.** (7 400 n 2 tableaux & fig.)

1925 625

L'Ind. voies ferrées et transp. autom., décembre, p.

SCHOPFER (J.). — Les nouveaux **freins à** p au carborundum. (3 900 mots, 1 tableau & fig.)

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1926 621 .132.3 (.44)

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VALLANTIN (R.). — **Locomotive compound à grande vitesse** avec surchauffeur de vapeur à quatre essieux couplés, à roues de 1 m. 800, bogie à deux essieux à l'avant et essieu porteur bissel à l'arrière de la Compagnie des chemins de fer de Paris à Lyon et à la Méditerranée. (2 200 mots, 2 tableaux & fig.)

1926 385 .113 (.44)

Revue générale des ch. de fer, février, p. 117.

Les résultats d'exploitation du réseau des chemins de fer de l'Etat en 1924. (3 700 mots & 2 tableaux.)

1926 385 .113 (.43)

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Les chemins de fer allemands et les résultats de la première année d'application du plan Dawes. (8 700 mots, 1 tableau & fig.)

1926 625 .235 (.42)

Revue générale des ch. de fer, février, p. 156.

Porte métallique de wagon. (300 mots & fig.)

1926 656 .212.8 (.3)

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Gabarits de chargement étrangers. (fig.)

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1926 625 .13 (.493)

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VERTONGEN (M.). Le **tunnel** sous la Forêt de Soignes. (1 600 mots & fig.)

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1926 62. (01

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LEMAITRE (R.). — **Calcul des plaques rectangulaires planes** supportées à leur pourtour et soumises à une charge unitaire uniforme. (4 600 mots & fig.)

1926 621 .31

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CAPART (G.). — **Tensions, surtensions, supertensions.** (5 000 mots & fig.)

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1926 621 .335 (.494)

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ZEHNDER-SPOERRY (R.). — Nouvelles **voitures automotrices électriques** de la Compagnie du chemin de fer Montreux--Oberland bernois. (3 600 mots, 1 tableau & fig.)

1926 625 .61 (06 (.44)

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VENTE (R.). — Compte rendu du **Congrès de Lyon** (octobre 1925). (8 500 mots & fig.)

1926 625 .113

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BOUVET (M.). — **Tracé des courbes de raccordement** des voies ferrées. (1 300 mots & fig.)

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1926 341 .324 (.43)

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Ruhrbesetzung und Reichsbahn. (23 000 Wörter, Tabellen u. Abb.)

1926 38 (01 & 656 .23 (01

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SAX (E.). — Preiserscheinungen des **Verkehrswesens.** (22 000 Wörter.)

1926 385 .588. (09 (.433)

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WINKLER (K.). — **Die Gewerkschaftsbewegung im deutschen Eisenbahnpersonal** unter besonderer Berücksichtigung Bayerns. (6 500 Wörter.)

1926 313 .385 (.43)

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Die Deutsche Reichsbahn nach dem Geschäftsbericht für 1923-24. (5 800 Wörter u. Tabellen.)

1926 313 .385 (.43)

Archiv für Eisenbahnwesen, Heft 1, Jan. u. Febr., S. 202.

Die Eisenbahnen in der tschechoslowakischen Republik im Jahr 1922. (1 500 Wörter u. Tabellen.)

1926 313 .385 (.489)

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1926 313 .385 (.494)

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BARSKE (U.). — Die mathematischen Grundlagen der einfachsten **nomographischen Rechentafeln,** ihre Herstellung und praktische Anwendung im Lokomotivmaschinenbau. (1 400 Wörter u. Abb.)

1926 621 .4 (.43)

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WENTZEL. — **Die Bedeutung des reinen Generatorgases** für die Betriebe der Reichseisenbahn. (4 600 Wörter u. Abb.)

1926 625 .616 (.54)

Glasers Annalen, Heft 3, 1. Februar, S. 41.

METZELTIN. — **Einige schmalspurige C-Lokomotiven** mit Tender für Ostasien. (1 000 Wörter u. Abb.)

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Lock and block. (1 600 words & fig.)

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1925 625 .141 (.73)
Bull. Amer. Ry. Eng. Ass^{on}, October, p. 81.
Report of Committee II — **Ballast.** (2 200 words.)

1925 624. (01 (.73) & 721 .9 (01 (.73)
Bull. Amer. Ry. Eng. Ass^{on}, October, p. 89.
Report of Committee XV — **Iron and steel structures.** (7 300 words.)

1925 621 .3 (.73) & 656 .256 (.73)
Bull. Amer. Ry. Eng. Ass^{on}, October, p. 113.
Report of Committee XVIII — **Electricity.** (20 000 words, tables & fig.)

1925 625 .111
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Report of Committee XVI — **Economics of railway location.** (3 200 words.)

1925 625 .113
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WEBB (W. L.). — The effect of **minor sags and humps on the operation of trains.** (2 900 words, 4 tables & fig.)

1925 624 .8 (01
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HOVEY (O. E.). — The design of treads for the supporting and segmental girders of **rolling lift bridges.** (3 200 words, 4 tables & fig.)

1925 621 .133.7 (.73)
Bull. Amer. Ry. Eng. Ass^{on}, November, p. 177.
Report of Committee XIII — **Water service.** (31 000 words, tables & fig.)

1925 625. 18 (.73)
Bull. Amer. Ry. Eng. Ass^{on}, November, p. 245.
Report of Committee XI — **Records and accounts.** (15 600 words & fig.)

1925 725 .33 (.73)
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Report of Committee XXIII — **Shops and locomotive terminals.** (9 600 words & fig.)

1925 656 .25 (.73)
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Report of Committee X — **Signals and interlocking.** (16 800 words & fig.)

1925 656 .2
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Joint use of **passenger terminals.** (9 000 words, ta & fig.)

1925 625 .162 (
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Report of Committee IX — **Signs, fences and cr ings.** (14 500 words, tables & fig.)

1925 692 (
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1925 693 (
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Report of Committee VIII — **Masonry.** (7 200 w & fig.)

1926 625 .143.
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1926 625 .14 (01 (
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Report of Committee V — **Track.** (15 600 word fig.)

1926 625 .142 (.
Bull. Amer. Ry. Eng. Ass^{on}, January, p. 687.
Report of Committee III — **Ties.** (19 000 wo tables & fig.)

1926 656 .2 (.
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Report of Committee XXI — **Economics of rail operation.** (8 400 words, 1 table & fig.)

1926 625 .1 (.
Bull. Amer. Ry. Eng. Ass^{on}, February, p. 759.
Report of Committee I — **Roadway.** (13 800 wo & fig.)

1926 624 .2 (.73) & 624 .3 (.
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Report of Committee VII — **Wooden bridges trestles.** (35 000 words, tables & fig.)

1926 625 .142.2 (.73) & 691 (.
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Report of Committee XVII — **Wood preservati** (38 000 words, tables & fig.)

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1926 621 .33 (09.1 (.
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Attractive cars put Buffalo & Erie Railway paying basis. (4 500 words, 2 tables & fig.)

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Photography an aid to the railways. (1 400 wor 1 table & fig.)

1926 621 .33 (.92)
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BALSEM (C. F.) — Java starts **electric trunk line.** 100 words & fig.)

1926 621 .33 (.73)
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BUDD (B. I.). — **Electric railways** have entered a w era. (4 000 words & 1 table.)

1926 388 (.73)
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Extensive Rapid Transit plan proposed for North rsey. (3 000 words & fig.)

1926 656 .254 (.73)
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1926 621 .338 (.431)
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KINDLER (E.). — **Light weight motor cars and** railers for the Berlin surface lines. (2 400 words & fig.)

1926 621 .335 (.494)
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Combination **locomotive-car** developed in Switzerland. 1 000 words & fig.)

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The **Drac-Romanche water power undertaking.** (2 600 words & fig.)

1926 624 .63 (.42)
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SCOTT (W. L.). — The construction of the **New Oswald-street bridge,** Glasgow. (1 700 words & fig.)

1926 625 .144.4 (.41)
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Relaying railway track by machine. (3 000 words & fig.)

1926 621 .335 (.73)
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New locomotives for the Norfolk and Western Railway. (2 500 words & fig.)

1926 624 .2 (01 (.42)
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LIDDELL (J. M.). — **British standard unit loading for highway bridges.** (1 400 words & fig.)

1926 621 .1 (09.3 (.44)
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The **Carnot centenary.** (4 000 words.)

1926 385. (09.1 (.42)
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Notes on **British railways** by a continental engineer. (3 500 words.)

1926 621 .331 (.494)
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The **Brugg sub-station** of the Swiss Federal Railways. (1 700 words & fig.)

1926 669 .1
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Institution of Mechanical Engineers. **The measurement of cutting temperatures.** (2 900 words & fig.)

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Sadi Carnot. (3 000 words.)

1926 621 .43 (01
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GIBSON (A. H.). — Piston temperatures and heat flow in **high-speed petrol engines.** (2 900 words, tables & fig.)

1926 385. (01 (.68)
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The **railways of Southern Rhodesia.** (2 600 words & fig.)

1926 621 .335 (.73)
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250 H. P. **petrol-electric motor rail car.** (1 200 words & fig.)

1926 621 .87 (.42)
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The **Toplis level-luffing crane.** (2 200 words & fig.)

1926 62. (01 & 669 .1
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HERBERT (E. G.). — The measurement of **cutting temperatures.** (3 600 words & fig.)

1926 669 .1 (.42)
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CURTIS (A. L.). — **Steel moulding sands** and their behaviour under high temperature. (2 300 words & fig.)

1926 656 .251
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MORGAN (H. E.) & HOOKHAM (F. J.). — **Long-burning signal lamps.** (3 100 words.)

1926 721 .3 (.42)
Engineering, No. 3139, February 26, p. 251.
The **vibro concrete-piling system.** (3 100 words & fig.)

1926 62. (01
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Tentative standards. (1 900 words.)

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PARODI (H.). — **Electrification** of a section of the Orleans Railway. (4 900 words & fig.)

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7 3/4 mile cascade tunnel for the Great Northern Ry. (800 words, 1 table & fig.)

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1926 624 .8 (.73)
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Building four-track steel bridge over Newark Bay : two types of foundation. (4 400 words & fig.)

1926 624 .63
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CROSS (H.). — Temperature deformations in **concrete arches.** (2 200 words & fig.)

1926 691. (01
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HUTCHINSON (G. W.). — Effect of manipulation on **strength of field concrete.** (1 000 words, 1 table & fig.)

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Subways on Chicago terminal of Illinois Central R. R. (1 900 words & fig.)

1926 721 .1 (.73)
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Wet foundation methods for river front building. (600 words & fig.)

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1926 625 .13 (.
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BETTS (C. A.). — Will hole through **Moffat tu** in July, 1926. (1 400 words & fig.)

1926 624 .32 (.
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1925 621 .1 (09.3 (.
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1925 621 .1 (09 & 621 .13
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LANGLEY (A. E.). — Circular curves and first p ciples of **permanent way calculations.** (2 500 wo 3 tables & fig.)

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1926 385. (07.4 (.
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1926 62. (01 & 669
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1926 621 .89
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KARELITZ (G. B.). — Charts for studying the film in **bearings.** (1 500 words, 1 table & fig.)

926 621 .116. (01
hanical Engineering, February, p. 133.
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926 62. (01
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VIKANDER (O. R.). — The **ring spring.** (2 400 rds & fig.)

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MANCE (H. O.). — **Pioneer railways** and feeder es. (2 800 words.)

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Safety and economy in **railway operation.** (2 300 rds & fig.)

1926 656 .25
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DOWNES (F.). — **Signalling development.** (1 300 rds & fig.)

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FRANCIS (C. J.). — **Railway stores.** Purchasing, nservation and distribution. (1 900 words & fig.)

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Committee V — **Instructions.** (11 700 words & fig.)

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Committee VIII — **Alternating current automatic** ock signaling. (5 400 words & fig.)

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ROACH (H. F.). — **Fibre.** (4 400 words & tables.)

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RUDD (A. H.). — **Position light signals.** (3 000 words.)

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AMES (A.). — **Insulated wire.** (7 900 words.)

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JAKOBSEN (B. F.). — **Stresses in thick arches of dams.** (21 000 words, 10 tables & fig.)

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ADCOCK (F.). — The indicating of **petrol engines.** (3 700 words & fig.)

1925 385. (09.3 (.42)
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ASPINALL (Sir John A. F.). — **Some railway notes** old and new. (11 200 words, tables & fig.)

1925 621 .83 (01
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ORCUTT (H. F. L.). — Characteristics and uses of **ground gears.** (6 300 words & fig.)

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SUTTON PIPPARD (A. J.). — The **stresses in a fly-wheel** due to acceleration. (1 800 words & fig.)

1926 621 .116
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1925 656 .222.1 (.73)
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1925 621 .132.5 (.73)
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First **Texas type locomotives** for T. & P. (2 500 words, tables & fig.)

1925 621 .336 (.73) & 721 .9 (.73)
Railway Age, No. 25, December 19, p. 1157.
D. T. & I. **overhead contact system.** (700 words & fig.)

1925 621 .4 (.73) & 621 .132.8 (.73)
Railway Age, No. 26, December 26, p. 1183.
New **gasoline rail car** developed. (1 400 words & fig.)

1925 621 .335 (.73)
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Oil electric locomotive makes record run. (1 900 words, 2 tables & fig.)

1925 625 .144.4
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Vacuum cleaner renovates ballast on Pennsylv (900 words & fig.)

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SCHULER (H. W.). — Maintaining an **elect contact system.** (2 300 words & fig.)

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1926 725 .35
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Burlington opens half million dollar **storeh** (3 500 words & fig.)

1926 385 .51
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Hearing on **railway labor bill.** (5 500 words.)

1926 621 .335
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High capacity **gas-electric car** for the Seab (1 400 words, 2 tables & fig.)

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Are **transverse fissures in rails** due to high w loads? (3 400 words.)

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MORSE (C. A.). — **Efficient transportation** dem modernization of lines. (5 300 words & fig.)

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PARODI (H.). — **Electrification** of the P Orleans Railway. (6 400 words, tables & fig.)

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WYLES (G. W.). — **Automatic and power signalling** n the New Zealand Railways. (2 300 words & fig.)

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Internal-combustion rail car and locomotive. (1 400 ords & fig.)

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ROBINSON (E. F.). — B. R. & P. demonstrates conomy of **tie preservation**. (7 000 words, 1 table fig.)

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Two-axle battery shunting locomotives built for the War Office. (800 words, 1 table & fig.)

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Beitrag zu den Grundlagen der Schnellaufend Halbdieselmotoren.

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Ueber die Festigkeit achsensymmetrischer Schalen.

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LEWE.

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1925 621 .39 (02

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Elektrische Lichtbogenschweissung. Ein Hilfsbuch für die Anwendung der Lichtbogenschweissung in der gesamten Industrie.

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Dampfkesselwesen in den Vereinigten Staaten von Amerika.

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Die Grundlagen für den Bau und die Einrichtung von Lokomotivausbesserungswerken.

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Die Erfindung der Lokomotive und ihre Entwicklung in Oesterreich.

Vienna, Anzengruber-Verlag Brüder Suschitzky, Favoritenstrasse, X.

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VEREIN DEUTSCHER EISENBAHNVERWALTUNGEN.

Bericht des Technischen Ausschusses des Vereins Deutscher Eisenbahnverwaltungen über die Frage der Einführung einer selbsttätigen durchgehenden Bremse für Güterzüge.

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VOLK (C.), Dipl.-Ing., Direktor der Beuth-Schule, Berlin.

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WULFF, Reichsbahndirektionspräsidenten A. D., und ZEITLER, Dr.

Jahrbuch für Eisenbahnwesen, Jahrgang 1925.

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Proceedings of the twenty-eighth annual meeting.

Atlantic City, New Jersey. June 23-26, 1925. Vol. XXV. Part I, Committee reports, new and revised tentative standards, list of standards and tentative standards. Part II, technical papers.

Philadelphia, Pa. Offices of the Society, 1315, Spruce Street.

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Up to date air brake catechism.

New York, Norman W. Henley Publishing Company. 30th edition. (Price : $4.00.)

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BRITTON (Jack).

Locomotive valve setting. Helpful shop hints about valve settings and « running engines over » for Stephenson, Walschaert and Baker geares, on both outside and inside admission engines.

New York, Simmons-Boardman Publishing Company, 30, Church Street. (5 × 7 1/4 inches), 192 pages, 64 illustr. (Price : $2.50.)

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CENTRAL STEEL COMPANY.

Development of the locomotive. A handsomely illustrated volume showing historic locomotives, « firsts » of a type, etc., with foreword by J. Snowden Bell. Begins with Cugnot's locomotive of 1769, the latest type shown being the Lima 2-8-4.

Massillon, Ohio. Published by the Central Steel Company. 64 pages.

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Handbook of railway blacksmithing.

New York, Simmons-Boardman Publishing Company, 30, Church Street. Vol. I : (5 × 7 3/4 inches), 217 pages, 183 illustr. (Price : $2.25); Vol. II : (5 × 7 3/4 inches), 247 pages, 212 illustr. (Price : $2.25); (Price of set : $4.00.)

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DEPARTMENT OF RAILWAYS. GOVERNMENT OF JAPAN.

Annual report for the year ending March 31st, 1923.

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1925 621 .9 (02

DOWD (Albert A.) & CURTIS (Frank W.).

Tool engineering; punches, dies and gages.

New York, McGraw-Hill Book Co. (6 × 9 inches), 341 pages, illustr. (Price : $3.50.)

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GLENN (Carl O.).

Air Brake Inspector's Handbook.

New York, Simmons-Boardman Publishing Company. 30, Church Street. (5 × 7 1/4 inches), 181 pages, 42 illustr. (Price : $2.00.)

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HOWSON (E. T.).

Railway engineering and maintenance cyclopedia.

New York, Simmons-Boardman Publishing Company, 30, Church Street. (9 × 12 inches), over 1 000 pages. (Price : $8.00.)

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Air brake manual for locomotive engineers.

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Manual of Argentine Railways for 1926.

London E. C. 2, Effingham Wilson, 15, Copthall Avenue. 82 pages with map. (Price : 2 s. 6 d. net.)

1926 621 .116. (02

Laying out for boiler makers and sheet metal workers. A practical work which describes the various problems simply and clearly, without going deeply into mathematics.

New York, Simmons-Boardman Publishing Company, 30, Church Street. Fourth edition. (9 × 12 inches), 374 pages. (Price : $8.00.)

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Power plant lubrication.

New York, McGraw-Hill Book Co. (6 × 8 inches), 275 pages, illustr., diagrams & tables. (Price : $3.00.)

1926 656 .284. (02

RAILWAY FIRE PROTECTION ASSOCIATION.

Handbook of the Railway Fire Protection Association.

Baltimore, Md. Published by the Association, c/o Secretary, B. & O. R. R. Bldg. 312 pages. (Price : $1.00.)

1926 625 .1 (02

RENCH (W. F.).

Simplified curve and switch work.

New York, 30, Church Street; London S. W. 1., 34, Victoria Street. Published by the Simmons-Boardman Publishing Company. (7 3/4 × 4 7/8 × 3/4 inches), 312 pages.

1926 656 .254. (02

RHOADS (Chas. Stanley), E. E.

Telegraphy and telephony with railway applications.

New York, Simmons-Boardman Publishing Company, 30, Church Street. (5 × 7 1/4 inches), 486 pages, 139 illustr. (Price : $3.00.)

1926 385. (09.1 (.3)

TALBOT.

Railways of the World. A fascination description of the history and evolution of the modern railroad, with special reference to the highlights which have marked this momentous development.

New York, Simmons-Boardman Publishing Company, 30, Church Street (8 1/2 × 10 3/4 inches). Two volumes, 728 pages, illustr. (Price of set : $10.00.)

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East Pittsburgh (U. S. A.), Published by the Westinghouse Technical Night School Press. In-8°, 544 pages & 390 fig.

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TWEEDIE (M. G.) & LASCELLES (T. S.).

Modern railway signalling.

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MAISON (F.). — Note sur la situation générale des ands réseaux de chemins de fer français au regard s accidents survenus en 1924. (10 000 mots & taaux.)

1926 385 .114 & 656 .232
nales des mines, février, p. 79.
LEROY (T.). — Nouvelle méthode pour la détermition des prix de revient et la tarification des transrts par chemins de fer. (10 000 mots & 10 tableaux.)

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RETRAINT. — Réparation d'avaries causées à des nts en fonte, à Paris. (1 400 mots & fig.)

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VALLETTE (R.). — Considérations sur le calcul des cs. Formules stables. Calcul graphique précis. Arcs ntinus. (6 800 mots & fig.)

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1926 621 .113
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ASTRUC (M.). — Etude d'un régulateur automatique d'alimentation pour chaudière à vapeur. (1 400 mots & fig.)

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COLMET-DAAGE (G.). — L'aération du chemin de fer métropolitain de Paris. (700 mots.)

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Rapport présenté par M. Ed. Sauvage, au nom du Comité des Arts mécaniques, sur un compresseur rotatif, imaginé et construit par M. R. Planche, ingénieur-constructeur, à Villefranche-sur-Saône (Rhône). (1 000 mots & fig.)

Bulletin de la Société des ingénieurs civils de France. (Paris.)

1926 621 .1 (09.3 (.44)

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Séance solennelle du mercredi 20 janvier 1926 pour la commémoration du Centenaire de la publication de l'ouvrage de Léonard Sadi Carnot : **Réflexions sur la puissance motrice du feu.** (17 400 mots & fig.)

Bulletin des transports internationaux par chemins de fer. (Berne.)

1926 656 .254 (.43)

Bull. des transp. intern. par ch. de fer, mars, p. 98.

Radiocommunications avec les trains en marche. (1 000 mots.)

1926 385 .113 (.47)

Bull. des transp. intern. par ch. de fer, mars, p. 104.

Les **Chemins de fer de l'Etat finlandais en 1924.** (1 300 mots.)

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Statistique des chemins de fer allemands pour les exercices 1922 et 1923. (300 mots & tableau.)

Bulletin de l'Union internationale des chemins de fer (Paris).

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Les **conventions internationales sur le transport des marchandises et des voyageurs** par chemins de fer. (11 300 mots.)

1926 385 .113 (.44)

Bull. de l'Union intern. des ch. de fer, février, p. 44.

Les chemins de fer exploités par l'Etat français pendant l'exercice 1924. (6 700 mots & tableaux.)

1926 656 .222 (.4 + .5)

Bull. de l'Union intern. des ch. de fer, février, p. 58.

DE FOUCAULT. — Réorganisation des **relations directes (voyageurs et bagages) entre l'Europe et l'Extrême-Orient.** Conférence de Moscou des 7-16 décembre 1925. (1 300 mots, tableaux & fig.)

1926 385 .63

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Génie civil. (Paris.)

1926 621 .165

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HENTSCH (M.). — L'amélioration du rendement de l'ailettage à réaction des **turbines à vapeur.** Essais du professeur Stodola sur une turbine à contre-pression Brown-Boveri. (1 800 mots, 2 tableaux & fig.)

1926 62. (01 & 721 .4 (01

Génie civil, n° 2274, 13 mars, p. 251.

CHAMBAUD (R.). — **Théorie des voûtes circulaires épaisses et des cylindres annulaires.** (2 600 mots & fig.)

1926 621 .43

Génie civil, n° 2274, 13 mars, p. 255.

Le fonctionnement des **moteurs Diesel sans compresseur.** (1 200 mots & fig.)

1926 62. (01 & 669

Génie civil, n° 2274, 13 mars, p. 258.

PORTEVIN (A.). — **Les franges d'écrouissage ou de corrosion.** (800 mots & fig.)

1926 621 .13 (09

Génie civil, n° 2275, 20 mars, p. 274.

DEMOULIN (M.). — Note sur le **développement de la locomotive.** (4 000 mots & fig.)

1926 62. (01 & 721 .4 (01

Génie civil, n° 2276, 27 mars, p. 297.

LEGENS (L.). — **Calcul des efforts dans un arc parabolique** doublement encastré à la suite de mouvements dans les culées. (700 mots & fig.)

1926 62. (01

Génie civil, n° 2277, 3 avril, p. 315.

SEIGLE (J.). — **Les premières déformations permanentes dans les aciers doux.** (2 200 mots & fig.)

1926 691

Génie civil, n° 2278, 10 avril, p. 339.

La fabrication continue du béton, avec dosage à sec, par les procédés Pelerin. (1 200 mots & fig.)

1926 621 .335 (.73)

Génie civil, n° 2279, 17 avril, p. 349.

Nouvelle **locomotive pétroléo-électrique** Baldwin-Westinghouse. (1 500 mots & fig.)

1926 621 .2

Génie civil, n° 2279, 17 avril, p. 358.

CHAUDY (F.). — Effet du passage des charges roulantes sur les **poutres des ponts de chemins de fer.** (800 mots & fig.)

La Science et la Vie. (Paris.)

1926 625 .216 (.44)

La Science et la Vie, avril, p. 329.

CAËL (J.). — Un nouvel **attelage automatique** vient d'être expérimenté par les Chemins de fer de l'Etat. (1 000 mots & fig.)

1926 656 .224

La Science et la Vie, avril, p. 348.

Tous les voyageurs pourront, à l'avenir, **marquer leurs places dans les trains.** (500 mots & fig.)

Les chemins de fer et les tramways. (Paris.)

1926 625 .245 (.44)

s ch. de fer et les tramw., mars, p. 40.

DESGARDES (E.). — **Wagon spécial pour le trans**rt de pièces de grandes dimensions et de poids élevé. 200 mots & fig.)

1926 621 .132.8

s ch. de fer et les tramw., mars, p. 42.

VALAT (E.). — La transmission mécanique appli-ée à la **traction sur voie ferrée par moteurs à com-stion interne.** (5 800 mots & fig.)

1926 625 .216

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SUTRA (P.). — Les **attelages automatiques** à trap-s. Les essais du « Willison ». (1 500 mots & fig.)

1926 621 .33 (09.1 (.73)

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SPIESS (E.). — De l'influence du **matériel roulant** r le rendement d'un réseau. (1 900 mots.)

1926 656 .222.5

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MAINCENT (J.). — Etude d'une méthode ration-elle pour l'établissement des **horaires-types des trains.** 3 700 mots.)

1926 621 .335 (.45)

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VALAT (E.). — **Locomotives à courant triphasé,** 0 000 volts 45 périodes, des Chemins de fer de l'Etat talien. (1 100 mots & fig.)

1926 621 .138.2

es ch. de fer et les tramw., avril, p. 60.

LEGRAS. — La **manutention des charbons** dans les parcs et dans les dépôts. (1 800 mots & fig.)

1926 656 .251

es ch. de fer et les tramw., avril, p. 62.

Signal lumineux à feux bicolores. (300 mots & fig.)

1926 625 144.4

es ch. de fer et les tramw., avril, p. 66.

Outil pour espacer les traverses. (450 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1926 385. (09.1 (.44)

L'Ind. voies ferrées et transp. autom., janvier, p. 1.

Questions d'ordre général, lois, décrets, dispositions réglementaires, projets et propositions de loi en préparation. (13 800 mots & fig.)

1926 625 .255 (.494)

L'Ind. voies ferrées et transp. autom., janvier, p. 15.

SCHOPFER (J.). — Les tendances actuelles des chemins de fer suisses en matière de **freinage électrique.** (1 300 mots & fig.)

1926 625 .616 (.44)

L'Ind. voies ferrées et transp. autom., janvier, p. 17.

LAURU. — III[e] assemblée générale technique (Lyon, 22-24 octobre 1925). 3[e] séance technique. Essais comparatifs de voitures automotrices. (3 400 mots, 2 tableaux & fig.)

1926 656 .231 (.44)

L'Ind. voies ferrées et transp. autom., février, p. 75.

THEVENEZ (R.). — Etude sur les **relèvements des tarifs** des grands réseaux de chemins de fer. (4 800 mots & 4 tableaux.)

1926 625 .142.4

L'Ind. voies ferrées et transp. autom., février, p. 102.

WEILER. — **Traverses en béton armé** (Système Gaudin). (1 300 mots & fig.)

1926 625 .151

L'Ind. voies ferrées et transp. autom., février, p. 107.

WEILER. — **Aiguillage électrique** (Système J.V.K.). (800 mots & fig.)

1926 625 .151

L'Ind. voies ferrées et transp. autom., février, p. 110.

WEILER. — **Dispositif d'aiguillage automatique** pour tramways ou chemins de fer (Système breveté Hervé). (3 500 mots & fig.)

1926 625 .142.4

L'Ind. voies ferrées et transp. autom., février, p. 116.

JACQUART. — La **traverse en béton armé.** (2 800 mots & fig.)

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1926 621 .132.7 (.44) & 621 .32.8 (.44)

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POLART. — Note sur les **locotracteurs à essence** de Paris-Saint-Lazare. (2 600 mots & fig.)

1926 385 .113 (.44)

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Résultats obtenus en 1924 sur le réseau des Chemins de fer de l'Etat en France, d'après les comptes d'administration publiés pour ladite année. (10 tableaux.)

1926 385 .113 (.43 + .47)

Revue générale des ch. de fer, mars, p. 213.

Résultats de l'exploitation des Chemins de fer de l'Etat polonais pour l'exercice 1924. (Tableaux.)

1926 656 .231 (.44)

Revue générale des ch. de fer, mars, p. 215.

Le **relèvement des tarifs** de chemins de fer. (4 400 mots.)

1926 621 .33 (09.3 (.494)

Revue générale des ch. de fer, mars, p. 227.

Un historique de l'**électrification des Chemins de fer fédéraux suisses.** (1 300 mots.)

1926 621 .132.8 (.47) & 621 .43 (.47)

Revue générale des ch. de fer, mars, p. 233.

Résultats en service de la **locomotive Diesel des Chemins de fer russes.** (2 700 mots.)

1926 656 .254 (.44)
Revue générale des ch. de fer, avril, p. 247.
MASSIN. — Note sur les particularités de l'organisation des postes centraux de régulation sur le réseau de l'Est. (2 300 mots & fig.)

1926 385 .113 (.494)
Revue générale des ch. de fer, avril, p. 277.
Les résultats d'exploitation des Chemins de fer fédéraux suisses pour 1924 et les prévisions budgétaires pour 1926. (4 000 mots.)

1926 625 .154
Revue générale des ch. de fer, avril, p. 301.
Pont tournant-secteur pour le tournage partiel des wagons à grand empattement. (500 mots & fig.)

1926 625 .216 (.52)
Revue générale des ch. de fer, avril, p. 305.
Application de l'attelage automatique au Japon. (2 000 mots, 2 tableaux & fig.)

Revue politique et parlementaire. (Paris.)

1926 385 .56
Revue politique et parlementaire, 10 avril, p. 5.
COLSON (C.). — L'assurance contre le chômage. (6 300 mots.)

1926 385. (01 (.6)
Revue politique et parlementaire, 10 avril, p. 89.
Transafricain et transsaharien. (4 500 mots & fig.)

Revue universelle des mines, de la métallurgie, des travaux publics, des sciences et des arts appliqués à l'industrie. (Liége.)

1926 62. (01 & 669 .1
Revue universelle des mines, 15 mars, p. 297.
THYSSEN (H.). — Contributions aux nouvelles méthodes d'essai des fontes. (1 600 mots & fig.)

1926 62. (01
Revue universelle des mines, 15 avril, p. 58.
LEMAIRE (L.). — Contribution au calcul des pièces minces soumises à des efforts de flexion. (2 400 mots, tableaux & fig.)

Revue universelle des transports. (Paris.)

1926 656 .234 (.44) & 656 .235 (.44)
Revue universelle des transports, n° 49, 10 mars, p. 63.
CHATEL (G.). — Les tarifs de transports sur les grands réseaux de chemins de fer en France. (1 200 mots & 2 tableaux.)

1926 625 .6 (09.1 (.44) & 656 .27 (.44)
Revue universelle des transports, n° 49, 10 mars, p. 67.
CHATEL (G.). — Les voies ferrées d'intérêt local en France. (2 700 mots & 2 tableaux.)

1926 621 .9
Revue universelle des transports, n° 51, 10 avril, p. 103.
LOEWENGUTH (E.). — Note sur un dispositif permettant d'assurer aux écrous des boulons une indesserrabilité parfaite et, par conséquent, d'éviter l'usure mécanique des divers organes constituant les voies et appareils de chemins de fer. (500 mots & fig.)

In German.

Archiv für Eisenbahnwesen. (Berlin.)

1926 347 .234 (.431) & 351 .757 (.431)
Archiv für Eisenbahnw., Heft 2, März u. April, S. 331.
KLÜSCHE. — Bemerkungen über Bergschäden an Eisenbahnen im rheinischwestfälischen Steinkohlengebiet. (9 000 Wörter u. Abb.)

1926 385 .4 (.498)
Archiv für Eisenbahnw., Heft 2, März u. April, S. 471.
Die Neuordnung der Rumänischen Eisenbahnen. (1 900 Wörter.)

1926 385 .113 (.52)
Archiv für Eisenbahnw., Heft 2, März u. April, S. 477.
Die japanischen Eisenbahnen in den Rechnungsjahren 1921-22 und 1922-23. (2 800 Wörter u. 4 Tabellen.)

1926 313 .385 (.43)
Archiv für Eisenbahnw., Heft 2, März u. April, S. 539.
Die Güterbewegung auf deutschen Eisenbahnen in den Jahren 1913, 1922 und 1923. (3 200 Wörter u. 13 Tabellen.)

1926 313 .385 (.469)
Archiv für Eisenbahnw., Heft 2, März u. April, S. 572.
ROESNER (E.). — Die Eisenbahnen in Portugal in den Jahren 1914-1919. (Tabellen.)

Glasers Annalen. (Berlin.)

1926 625 .61 (09.1 (.431)
Glasers Annalen, Heft 2, 15. Januar, S. 22.
Besichtigung der Betriebsanlagen der Berliner Strassenbahn-Betriebs-Gesellschaft am 15. Oktober 1925. (2 000 Wörter u. Abb.)

1926 625 .27
Glasers Annalen, Heft 2, 15. Januar, S. 24.
GOTTSCHALK (E.). — Holznormen im Eisenbahnwagenbau. (600 Wörter u. Abb.)

1926 621 .134.3 (.43)
Glasers Annalen, Heft 4, 15. Febuar, S. 59.
LIPPERHEIDE (W.). — Untersuchung der Innensteuerung der 1 E-Dreizylinder-Güterzug-Lokomotiven der Deutschen Reichsbahn. (2 100 Wörter, 3 Tabellen u. Abb.)

1926 621 .133.3 (01 (.43)
Glasers Annalen, Heft 5, 1. März, S. 67.
ILTGEN. — Normung und austauschbare Fertigung der Washluken. (2 400 Wörter, Tabellen u. Abb.)

26 625 .213
rs Annalen, Heft 5, 1. März, S. 82.
ANCKE (R. J.). — **Federschwingungsbremse** für nenfahrzeuge aller Art. (400 Wörter u. Abb.)

26 625 .245 & 656 .212.6
rs Annalen, Heft 6, 15. März, S. 87.
ZYGODE (D.). — Die **Mechanisierung des Güter-**hlags. (6 000 Wörter u. Abb.)

26 621 .132.8 (.43) & 621 .4 (.43)
rs Annalen, Heft 7, 1. April, S. 113.
bbefahrt mit dem **Wumag-Oeltriebwagen** auf der ke Görlitz-Oberschreiberhau. (800 Wörter & Abb.)

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Bulletin, American Railway Engineering Association. (Chicago.)

26 625 .17 (.73)
Amer. Ry. Eng. Ass^{on}, March, p. 1005.
port of Committee XXII — **Economics of railway** (25 000 words & tables.)

26 725 .3 (.73)
Amer. Ry. Eng. Ass^{on}, March, p. 1060.
port of Committee VI — **Buildings.** (65 000 words .)

26 625 .113. (01
Amer. Ry. Eng. Ass^{on}, March, p. 1221.
MPBELL (J. L.). — A monograph on translating hysical characteristics of a railway line into equi- t straight and level miles and ton-mile cost in the mics of railway location and operation. (4 000 & tables.)

Electric Railway Journal. (New York.)

26 621 .335 (.73)
ric Railway Journal, No. 9, February 27, p. 366.
sel-electric locomotives discussed in joint New meeting. (4 500 words & fig.)

26 621 .39 (.73) & 625 .212 (.73)
ric Railway Journal, No. 10, March 6, p. 413.
ITTAIN (J. R.). — Flexible arrangement for ng wheel flanges. (600 words & fig.)

26 625 .255 (.73)
ric Railway Journal, No. 11, March 13, p. 447.
PINWALL (L. M.). — **Regenerative braking** tried ultiple unit trains. (1 900 words.)

26 388 (.73)
ric Railway Journal, No. 14, April 3, p. 580.
LLER (J. A. Jr.). — **Street car operation** hampe- by unscientific traffic regulation. (3 700 words, les & fig.)

1926 625 .176 (.73)
Electric Railway Journal, No. 14, April 3, p. 585.
MEYERS (E. S.). — **Wide gaging 4 762 ft. of double track** in New Orleans. (2 400 words & fig.)

Engineer. (London.)

1926 621 .94 (.42)
Engineer, No. 3662, March 5, p. 278.
An improved **automatic lathe.** (850 words & fig.)

1926 62. (01 & 669. (01
Engineer, No. 3663, March 12, p. 292.
The **Institute of Metals.** (3 500 words.)

1926 621 .91
Engineer, No. 3663, March 12, p. 303.
High-speed wood planing and matching machine. (1 600 words & fig.)

1926 621 .43 (01
Engineer, No. 3665, March 26, p. 364.
CHORLTON (A. E. L.). — The high efficiency **oil engine.** (3 000 words, 6 tables & fig.)

1926 669 .1 (01
Engineer, No. 3665, March 26, Supplement, p. 34.
GRIFFITHS (W. T.). — **The hardening of steel :** a review and some comments. (1 900 words & fig.)

1926 621 .331 (.44)
Engineer, No. 3666, April 2, p. 376.
Hydraulic developments of the Midi Railway in the Ossau Valley. (2 600 words & fig.)

1926 621 .89
Engineer, No. 3667, April 9, p. 403.
BENTON (W. A.). — Some aspects of **friction.** (2 600 words & fig.)

1926 624 .8 (.71)
Engineer, No. 3667, April 9, p. 409.
The second narrows bridge, Vancouver. (1 100 words & fig.)

1926 656 .223.2 (.42)
Engineer, No. 3667, April 9, p. 415.
The **privately-owned railway wagon.** (1 700 words.)

Engineering. (London.)

1926 52 .69
Engineering, No. 3138, February 19, p. 245.
WEYMOUTH (F. E.). — The Brock process of making **topographic surveys from the air.** (4 600 words & fig.)

1926 621 .94
Engineering, No. 3140, March 5, p. 317.
Automatic internal **grinding machine.** (2 400 words & fig.)

1926 625 .13 (.54)
Engineering, No. 3143, March 26, p. 385.
MUGGERIDGE (H. C.). — The **doubling of the upper Sone bridge**, India. (1 700 words & fig.)

1926 621 .43 (01
Engineering, No. 3143, March 26, p. 409.
CHORLTON (A. E. L.). — The high efficiency **oil-engine**. (4 400 words, 7 tables & fig.)

1926 385 .1 (.42)
Engineering, No. 3145, April 9, p. 467.
The **railway situation**. (2 300 words.)

Engineering News-Record. (New York.)

1926 621 .33 (.3)
Engineering News-Record, No. 6, February 11, p. 240.
Railway electrification progress during 1925. (2 400 words.)

1926 625 .11 (.73)
Engineering News-Record, No. 8, February 25, p. 308.
Railway construction: recent and prospective. (4 400 words & fig.)

1926 621 336 (.73) & 721 .9 (.73)
Engineering News-Record, No. 8, February 25, p. 313.
Precast concrete arches carry trolley wires. (800 words & fig.)

1926 625 .162 (.73)
Engineering News-Record, No. 8, February 25, p. 314.
MACKALL (J. N.). — Maryland negotiates agreement for **crossing elimination**. (1 900 words.)

1926 625 .142.2 (.73) & 691 (.73)
Engineering News-Record, No. 8, February 25, p. 318.
New creosoting plant for Southern Pacific at Oakland. (2 600 words & fig.)

1926 621 .33 (.73)
Engineering News-Record, No. 8, February 25, p. 322.
BRUMLEY (D. J.). — **Chicago terminal electrification** on the Illinois Central. (4 900 words, 1 table & fig.)

1926 621 .7 (.73)
Engineering News-Record, No. 8, February 25, p. 328.
Longest ballasted-deck **plate-girder bridge**; E., J. & E. Ry. (1 200 words & fig.)

1926 656 .214 (.73)
Engineering News-Record, No. 9, March 4, p. 354.
TRATMAN (E. E. R.). — Unification of **railway freight terminals**. (3 200 words.)

1926 624 .63 (.73)
Engineering News-Record, No. 9, March 4, p. 357.
Concrete arch bridge at Donner Summit, Calif. (500 words & fig.)

1926 691 (
Engineering News-Record, No. 9, March 4, p. 368.
Concrete and concrete products control and ma facture. (2 600 words.)

1926 625 .13 (
Engineering News-Record, No. 9, March 4, p. 370.
Recent rock tunneling methods, Illinois Central R (800 words & fig.)

1926
Engineering News-Record, No. 10, March 11, p. 408
BOUILLON (A. M.). — How to prevent and to tore **frozen concrete**. (2 800 words & fig.)

1926 721 .3
Engineering News-Record, No. 10, March 11, p. 412
FLEMING (R.). & WEISKOPF (W. H.). — **Bat plate columns** : their status and a design theory. (2 words, 1 table & fig.)

1926 624.
Engineering News-Record, No. 10, March 11, p. 416
STALEY (G. L.). — **Bridge loadings** and en ratings. (400 words & 2 tables.)

1926 621 .52 (
Engineering News-Record, No. 11, March 18, p. 438
Large cantilever planned for Mount Hope toll bri (1 500 words & fig.)

1926 624 .8 (
Engineering News-Record, No. 12, March 25, p. 474
Heavy steelwork in long **plate-girder bridge with twin lift spans**. (4 600 words & fig.)

1926 625 .174 (
Engineering News-Record, No. 12, March 25, p. 486
Melting snow on terminal tracks of Illinois Cen R. R. (1 300 words & fig.)

1926 62. (01 (.52) & 625 .143.3 (
Engineering News-Record, No. 13, april 1, p. 520.
SUZUKY (M.). — **Track device for detecting de** in rails. (1 600 words & fig.)

Institution of Engineers, Australia. (Sydney

1923 62 .01 & 721 .3
Institut. of Engin., Australia, Transact., Vol. IV,
ROSS (C. N.). — **Column eccentricity**. (5 300 wo 7 tables & fig.)

1923 621 .135.4 (.94) & 625 .215 (
Institut. of Engin., Australia, Transact., Vol. IV, p
MORT (H. S.). — **Compensation of grades on way curves in Australia**. (5 300 words, 4 tables &

1923 621
Institut. of Engin., Australia, Transact., Vol. IV, p.
COATES (W. A.). — Some notes on the applica **and design of large switching apparatus**. (9 700 wo 2 tables & fig.)

621 .135.4 (.91) & 625 .215 (.94)
t. of Engin., Australia, Transact., Vol. IV, p. 240.
RT (H. S.). — Compensation of grades on rail-urves in Australia. (Discussion.) (10 600 words

6 621
t. of Engin., Australia, No. 9, January, p. 47.
PHENS (C. T.). — Some notes on modern quick-ing cement. (4 000 words & fig.)

al of the Institute of Transport. (London.)

6 656 .1
al of the Institute of Transport, March, p. 230.
GLESOME (Sir John). — **Roadless traction.** 0 words.)

6 385. (09.1 (.73)
al of the Institute of Transport, March, p. 246.
ERRINGTON (C. E. R.). — **Rail transport sys-**of the United States. (11 000 words & 2 tables.)

6 625 .22 & 625 .24
al of the Institute of Transport, March, p. 259.
LSON (A. R.). — **Transport of exceptional loads.** words.)

6 386 (.42)
al of the Institute of Transport, April, p. 275.
KINSON (H. D.). — State ownership of water-(15 000 words & 4 tables.)

6 656
al of the Institute of Transport, March, p. 294.
RLEY (R. E). — **Transport** from a trader's view-(7 300 words & 1 table.)

6 656. (01
al of the Institute of Transport, March, p. 303.
RSDEN (A. G.). — Industrial **traffic manage-** (6 500 words.)

Mechanical Engineering. (New York.)

6 621 132.8 (.73) & 621 .335 (.73)
anical Engineering, March, p. 205.
MP (H.). — Electric transmission for **internal-ustion engines.** (10 800 words & fig.)

6 621 .133. (01
anical Engineering, March, p. 218.
ROK (G. A.). — Radiation in **boiler furnaces.** 0 words, 2 tables & fig.)

6 621 .392. (01
anical Engineering, March, p. 221.
LLER (S. W.). — **Fusion-welded pressure vessels.** 0 words & fig.)

6 621 .165. (01
anical Engineering, March, p. 227.
ARREN (G. B.) & KEENAN (J. H.). — A machine testing **steam-turbine nozzles** by the reaction od. (4 500 words & fig.)

1926 621 .8 (01
Mechanical Engineering, March, p. 240.
The tension ratio and **transmissive power of belts.** (5 400 words, 3 tables & fig.)

1926 621 .31 (01
Mechanical Engineering, March, p. 251.
KIMBALL (A. L.) & HULL (E. H.). — **Vibration phenomena of a loaded unbalanced shaft** while passing through its critical speed. (4 200 words & fig.)

1926 621 .116 (.73) & 621 .133.7 (.73)
Mechanical Engineering, April, p. 317.
HALL (R. E.). — **Boiler-water conditioning** with special reference to high operating pressure and corrosion. (8 000 words & fig.)

1926 621 .133.4 (.73)
Mechanical Engineering, April, p. 352.
Spark arresters and forest fires. (1 800 words.)

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1926 656 .25 (.42)
Modern Transport, No. 366, March 20, p. 5.
Four-aspect signalling. Southern Railway installation. (1 000 words & fig.)

1926 625 .4 (.42)
Modern Transport, No. 368, April 3, p. 3.
London Underground Railway developments. (950 words & fig.)

1926 621 .33 (.68)
Modern Transport, No. 369, April 10, p. 3.
Railway electrification in South Africa. (2 200 words & fig.)

1926 621 .33 (.494)
Modern Transport, No. 369, April 10, p. 4.
Swiss Federal Railways, **Progress of electrification schemes.** (1 700 words.)

Proceedings, American Society of Civil Engineers. (New York.)

1926 62. (01 & 721 .3 (01
Proceed. Amer. Soc. Civil Eng., March, p. 146.
Progress report of the Special Committee on **steel column research.** (7 200 words, 10 tables & fig.)

1926 62. (01 & 691. (01
Proceed. Amer. Soc. Civil Eng., March, p. 210.
Progress report of the Special Committee on **cement.** (5 800 words, 1 table & fig.)

1926 692. (01 (.73)
Proceed. Amer. Soc. Civil Eng., March, p. 223.
Progress report of Special Committee on **standard construction contracts.** (21 400 words.)

1926 52 .69

Proceed. Amer. Soc. Civil Eng., March, p. 367.

BERGEN (G. T.). — Aeroplane topographic surveys. (14 000 words & fig.)

1926 624. (01 (.73)

Proceed. Amer. Soc. Civil Eng., March, p. 442.

Final report of the Special Committee on impact in highway bridges. (2 800 words, 1 table & fig.)

1926 624 .2 (01

Proceed. Amer. Soc. Civil Eng., March, p. 473.

Moments in restrained and continuous beams by the method of conjugate points. (17 400 words, tables & fig.)

1926 691

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BAYLIS (J. R.). — Corrosion of concrete. (11 000 words, 7 tables & fig.)

1926 624 .2 (01

Proceed. Amer. Soc. Civil Eng., April, p. 645.

Moments in restrained and continuous beams by the method of conjugate points. (17 500 words, 32 tables & fig.)

1926 62. (01 & 721 .9

Proceed. Amer. Soc. Civil Eng., April, p. 733.

THOMPSON (M.). — Stresses in helically reinforced concrete columns. (1 000 words & fig.)

Railway Age. (New York.)

1926 624 .8 (.73)

Railway Age, No. 3, January 16, p. 217.

Central of New Jersey builds remarkable bridge. (3 500 words & fig.)

1926 385 .58 (.73)

Railway Age, No. 3, January 16, p. 223.

New railway labor bill. (4 000 words.)

1926 621 .138. (01

Railway Age, No. 3, January 16, p. 229.

RICHARDSON (L.). — Economical locomotive mileage between general repairs. (1 300 words & fig.)

1926 625 .246. (01 & 656 .281. (01

Railway Age, No. 3, January 16, p. 234.

SYMINGTON (T. H.). — Causes and prevention of freight car derailments. (3 200 words & fig.)

1926 656 .256 (.73)

Railway Age, No. 5, January 30, p. 323.

Automatic signals constructed in record time on Seaboard. (2 700 words & fig.)

1926 621 .132.5 (.73)

Railway Age, No. 5, January 30, p. 329.

4-8-2 type locomotives for N. Y. C. (1 000 words, 1 table & fig.)

1926 656 .211.6 (.

Railway Age, No. 5, January 30, p. 341.

Railway and highway transportation agencies sh cooperate. (3 500 words & fig.)

1926 656 .211.4 (.

Railway Age, No. 7, February 13, p. 418.

WILSEY (G. H.). — St. Paul Union depot comple (3 200 words & fig.)

1926 385 .51 (.

Railway Age, No. 7, February 13, p. 423.

Union-management co-operation. (8 000 words.)

1926 621 .132.3 (.

Railway Age, No. 7, February 13, p. 429.

4-8-2 type locomotives for the Texas & Pacific. words, 1 table & fig.)

1926 621 .33 (.

Railway Age, No. 7, February 13, p. 432.

Illinois Central electrification progress. (1 700 w & fig.)

1926 656 .222 (.

Railway Age, No. 7, February 13, p. 441.

DINAN (D. W.). — Main tracking of freight tra (1 500 words.)

1926 621 .132.8 (.

Railway Age, No. 7, February 13, p. 443.

CANDEE (A. H.). — Self-propelled cars and loco tives. (3 700 words & fig.)

1926 656 .211 (.73) & 656 .212 (.

Railway Age, No. 9, February 27, p. 514.

I. C. Chicago terminal project now one-third c pleted. (3 800 words & fig.)

1926 656 .256 (.

Railway Age, No. 9, February 27, p. 521.

G. H. & S. A. uses national system of autom train stop. (2 700 words & fig.)

1926 621 .

Railway Age, No. 9, February 27, p. 525.

HERSHBERGER (D. C.). — Electric locomot classification. (1 400 words, 1 table & fig.)

1926 621 .134.1 (.

Railway Age, No. 9, February 27, p. 527.

POWNALL (W. A.). — Operation of three-cylin engines on Wabash. (3 000 words & tables.)

1926 385. 51 (.

Railway Age, No. 9, February 27, p. 531.

Hooper criticises new labor bill. (6 200 words.)

1926 621 .132.1 (.4 + .

Railway Age, No. 9, February 27, p. 538.

FINLEY (W. H.). — European motive power tren (3 600 words.)

621 .133.3 (.73)
ay Age, No. 10, March 6, p. 575.
lellon water-tube boiler tests. (3 000 words, s & fig.)

625 .258 (.73) & 656 .259 (.73)
ay Age, No. 10, March 6, p. 593.
ois Central installs G. R. S. electric car retarders. words & fig.)

624 .1 (.73)
ay Age, No. 15, March 13, p. 795.
novel methods in building bridge substructure. words & fig.)

625 .232 (.73)
ay Age, No. 15, March 13, p. 803.
que observation-club cars for the Northern Paci- 400 words & fig.)

621 .335 (.73)
ay Age, No. 15, March 13, p. 809.
Diesel-electric locomotive. (4 700 words, 1 table)

621 .33 (.73)
ay Age, No. 15, March 13, p. 817.
NDERSLUIS (W. M.). — Multiple unit cars for s Central. (2 700 words.)

621 .133.2
ay Age, No. 15, March 13, p. 819.
rmic syphons used in combustion chambers. (800 & fig.)

625 .1 (.73)
ay Age, No. 16, March 20, p. 846.
nique line relocation problem. (800 words & fig.)

621 .131.2 (.73)
ay Age, No. 16, March 20, p. 849.
three-cylinder locomotive. (2 700 words, 1 table)

656 .233 (.73)
ay Age, No. 16, Mach 20, p. 859.
rp competition aroused by oil traffic. (6 000 words

385 .21 (.73)
ay Age, No. 16, March 20, p. 864.
nscontinental rates denied. (5 900 words.)

621 .132.5 (.73)
ay Age, No. 16, March 20, p. 869.
tral of Georgia 2-10-2 locomotives. (700 words, & fig.)

725 .33 (.73)
ay Age, No. 17, March 27, p. 892.
OD (B. A.). — Mobile & Ohio builds large shop ord time. (2 200 words & fig.)

621 .132.7 (.73)
ay Age, No. 17, March 27, p. 901.
ht-wheel switchers for the T. & P. (1 700 words, le & fig.)

1926 656 .253 (.73)
Railway Age, No. 17, March 27, p. 908.
Train control devices approved. (5 000 words.)

1926 621 .335 (.73)
Railway Age, No. 17, March 27, p. 911.
MURPHY (T. H.). — Large gas-electric car for the Boston & Maine. (1 500 words & fig.)

1926 621 .133.7 (.73)
Railway Age, No. 18, April 3, p. 951.
Great Northern reduces pitting of locomotive boilers. (6 000 words, tables & fig.)

1926 656 .25 (.73)
Railway Age, No. 18, April 3, p. 959.
SPERRY (H. M.). — Train movements directed by signal indication. (4 300 words & fig.)

1926 347 .23 (.73) & 621 .133.4 (.73)
Railway Age, No. 18, April 3, p. 971.
COOLIDGE (P. T.). — Claims arising from forest fires present special problem. (2 400 words & fig.)

Railway Engineer. (London.)

1926 621 .131.3 (.44)
Railway Engineer, April, p. 119.
Eight-coupled express locomotives in France. (3 400 words, tables & fig.)

1926 625 .144.1 (01
Railway Engineer, April, p. 123.
HARVEY (A. F.). — Sleeper-spacing and its effect on axle-load. (1 200 words, 1 table & fig.)

1926 625 .1 (.54 + .58)
Railway Engineer, April, p. 124.
The construction of the Khyber Railway. (2 900 words & fig.)

1926 624 .62 (.944)
Railway Engineer, April, p. 129.
Laminated bent plank arch bridges, New South Wales Railways. (800 words & fig.)

1926 621 .335 (.494)
Railway Engineer, April, p. 131.
New single-phase express locomotives in Switzerland. (2 300 words & fig.)

1926 621 .132.5 (.66)
Railway Engineer, April, p. 136.
Three-cylinder superheated freight locomotives for the Nigerian Railway. (500 words & fig.)

1926 691 (.68)
Railway Engineer, April, p. 138.
Seasoning of South African timber. (3 400 words & fig.)

1926 625 .232 (.82)
Railway Engineer, April, p. 142.
New sleeping and first-class carriages for the Central Argentine Railway. (700 words & fig.)

Railway Engineering & Maintenance. (Chicago.)

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Dispositif de fixation des rails sur traverses en béton. (1 200 mots & fig.)

1926 621 .335 (.494)
Les ch. de fer et les tramw., juin, p. 87.
Les locomotives suisses D° 6/6 n° 15301 du Chemin de fer du Secthal. (1 500 mots & fig.)

1926 621 .335
Les ch. de fer et les tramw., juin, p. 89.
SPIESS (E.). — **Automotrices et locomotives Diesel-électriques.** (2 600 mots, 1 tableau & fig.)

1926 621 .335 (.43)
Les ch. de fer et les tramw., juin, p. 93.
VALAT (E.). — **Locomotives électriques** type 2-C-2 des Chemins de fer de l'Etat allemand. (2 200 mots & fig.)

1926 625 .144.4
Les ch. de fer et les tramw., juin, p. 95.
Presse portative à **cintrer les rails.** (450 mots & fig.)

1926 656 .212.5
Les ch. de fer et les tramw., juin, p. 96.
GUIRAUD (E.). — L'appareillage moderne des **gares de triage.** (4 900 mots.)

1926 625 .143.4
Les ch. de fer et les tramw., juin, p. 100.
Un nouveau dispositif d'indesserrabilité d'écrous pour **éclissages de voies ferrées.** (800 mots & fig.)

1926 625 .21
Les ch. de fer et les tramw., juin, p. 101.
Dispositif pour vérifier les **essieux des véhicules.** (250 mots.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1926 625 .611 (.44
L'Ind. voies ferrées et transp. autom., mars, p. 138.
Projet de loi « ayant pour objet de fixer le régime applicable aux voies ferrées d'intérêt local, ainsi qu'aux réseaux secondaires d'intérêt général pendant la période comprise entre le 1er janvier 1927 et le 31 décembre 1935 ». (6 000 mots.)

1926 621 .331 (.44
L'Ind. voies ferrées et transp. autom., mars, p. 150.
ALLIAUME. — Eléments de **sous-station automate** (2 500 mots & fig.)

1926 625 .213. (0
L'Ind. voies ferrées et transp. autom., avril, p. 200.
KERAVAL (J.). — Théorie élémentaire de la **suspension des véhicules.** (4 000 mots & fig.)

1926 621 .33
L'Ind. voies ferrées et transp. autom., avril, p. 210.
CASTAING. — Exposé de la technique des **prises de courant aériennes pour tramways.** (8 100 mots 1 tableau & fig.)

1926 621 .33
L'Ind. voies ferrées et transp. autom., mai, p. 253.
FRANC. — Recherche et localisation des défauts d'isolement sur les barres de prise de courant dans les lignes de tramways alimentées en caniveau. (2 100 mots & fig.)

1926 621 .33
L'Ind. voies ferrées et transp. autom., mai, p. 257.
Motrice électrique type « L ». (4 600 mots, 3 tableaux & fig.)

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926 621 .33 (.44)
ue économique de Bordeaux, n° 160, p. 1.
NOUVION (G.). — **L'électrification des chemins** er. (1 500 mots.)

625 .112
ue économique de Bordeaux, n° 167, p. 241.
LALOUBIE (G. H.). — Les diversités **d'écartement** voies de chemins de fer. (2 100 mots.)

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926 62. (01 & 721 .3
ue de l'Ecole polytechnique, mai, p. 431.
ANDEPERRE (L.). — Résistance à l'écrasement piliers en béton fretté. (6 800 mots & fig.)

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926 625 .611 (.44)
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ERTHELIER. — Modifications à apporter aux trats des chemins de fer d'intérêt local. (1 500 s.)

926 625 .143.3
ue générale des ch. de fer, mai, p. 346.
IERKLEN. — Les ruptures accidentelles des rails. maux et les remèdes. (11 000 mots & fig.)

926 621 .133.2
ue générale des ch. de fer, mai, p. 415.
Mode de protection des tirants qui soutiennent le du foyer des locomotives. (1 000 mots & fig.)

1926 385 .59 (.44)
ue générale des ch. de fer, juin, p. 427.
GIRARD (J.). — Une enquête démographique sur le rsonnel de la Compagnie du chemin de fer du Nord. 000 mots, 11 tableaux & fig.)

1926 625 .242 (.44)
ue générale des ch. de fer, juin, p. 453.
OUDET (J.). — Note sur la construction en série wagons-tombereaux du type unifié aux ateliers de lhouse. (3 200 mots & fig.)

1926 625 .214
ue générale des ch. de fer, juin, p. 463.
Note sur une nouvelle boîte à billes pour matériel lant de chemins de fer et tramways. (3 300 mots fig.)

1926 656 .211.5 (.82)
ue générale des ch. de fer, juin, p. 485.
Tableau indicateur de départ des trains à la gare de tiro, à Buenos-Ayres. (1 100 mots & fig.)

1926 621 .33 (.45)
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Essais de traction avec courant triphasé à la fréquence industrielle sur la ligne du Mont-Cenis. (1 800 mots & fig.)

1926 621 .132.5 (.73)
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Nouvelle **locomotive 2-10-4 pour le Texas and Pacific Railroad.** (1 000 mots & fig.)

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1926 621 .116
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PROTHAIS (F.). — **Le tirage.** (1 400 mots & fig.)

1926 621 .8
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CABAUD (R.). — Un nouveau **régulateur de vitesse.** (1 800 mots & fig.)

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1926 669 .1 & 62. (01
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DECHERF (E.). — La bavure d'estampage et l'utilité des **essais de macrostructure.** (1 700 mots & fig.)

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1926 625 .617
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LAVOIEPIERRE (L.). — L'emploi des **wagons transbordeurs** sur les voies ferrées d'écartements différents. (2 600 mots & fig.)

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Die russischen Eisenbahnen in den Wirtschaftsjahren 1922-23 und 1923-24. (3 500 Wörter u. Tabellen.)

1926 313 .385 (.45)
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1926 621 .95
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BOEHME. — **Räummaschine.** (1 000 Wörter, 1 Tabelle u. Abb.)

1926 625 .246
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KLEIN. — **Austauschbau bei Eisenbahnwagen, Formeisen.** (500 Wörter u. Abb.)

1926 385 & 621 .14
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van HEES (H.). — **Die Dampf-, Oel- und Druckluftlokomotiven** auf der Deutschen Verkehrsausstellung in München. (2 800 Wörter, 1 Tabelle u. Abb.)

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WALTHER. — **Fördervorrichtungen** in Giessereien. (2 000 Wörter u. Abb.)

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RUDY. — Die gegenwärtige Lage der Staatseisenbahnen der U. d. S. S. R. (1 500 Wörter u. Tabellen.)

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ILTGEN. — Die **Normung und Unterhaltung der Dampfkolben und Kolbenringe** bei den vorhandenen Reichsbahn-Lokomotiven. (2 300 Wörter, 2 Tabellen u. Abb.)

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1926 625 .143 (.73)
Electric Railway Journal, No. 8, February 20, p. 312.
LOVELL (C. G.). — **Rail bond maintenance.** (2 900 words, 1 table & fig.)

1926 385 .57 (.73) & 385 .586 (.73
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DEWHURST (J. A.). — **Personnel selected a trained** in Milwaukee on scientific basis. (3 600 wor & fig.)

1926 625 .17 (.73
Electric Railway Journal, No. 16, April 17, p. 665.
New Orleans an extensive user of **track machine** (1 800 words & fig.)

1926 621 .336 (.73
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Some novelties in **overhead work** in Atlanta. (1 0 words & fig.)

1926 621 .39 (.73
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Thermit welds used in rapid track construction. (8 words & fig.)

1926 388 (.73
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Rapid transit line constructed for Milwaukee. (1 6 words & fig.)

1926 621 .336 (.73
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VILLIERS (W. H. C.). — **Standardized overhead f** the Canadian National Railways. (1 000 words & fig

1926 621 .333 (.73
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WHEELER (W. C.). — Improved testing decreas armature **open circuits.** (1 900 words & fig.)

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Trolley wire breaks reduced 43 per cent in Bosto (800 words & fig.)

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1926 62. (01 & 669. (
Engineer, No. 3668, April 16, p. 434.
High frequency **fatigue tests.** (1 700 words, 1 tab & fig.)

1926 625 .143
Engineer, No. 3668, April 16, p. 435.
GARRETT SMITH (N.). — The **fracturing of fi** plates. (1 100 words & fig.)

1926 625 .235 (.42
Engineer, No. 3669, A pril 23, p. 472.
All-steel **passenger rolling stock.** (1 000 words.)

1926 621 .94 (.431) & 621 .95 (.43
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A vertical boring and turning mill. (900 wor & fig.)

1926 625 .2
Engineer, No. 3670, April 30, p. 503.
Economy in **axle-box design.** (1 200 words & fig.)

1926 385 .589 (.42)
ngineer, No. 3671, May 21, p. 513.
The **general strike.** (2 600 words.)

1926 621 .33 (.42)
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HALLY (G.). — **Electric train testing** on the Metropolitan Railway. (3 700 words & fig.)

1926 62. (01
ngineer, No. 3671, May 21, p. 520.
CARRINGTON (H.). — **Bending and torsional strains** d **stresses** in a loaded crank shaft. (2 000 words fig.)

1926 385 .589 (.42)
ngineer, No. 3671, May 21, p. 527.
The **general strike.** (1 700 words.)

1926 669 .1
ngineer, No. 3671, May 21, p. 528.
Report on the **heterogeneity of steel ingots.** (5 400 ords.)

1926 621 .132.8 (.493)
ngineer, No. 3671, May 21, p. 532.
Industrial locomotive with vertical boiler. (600 words fig.)

1926 621 .97 (.42)
ngineer, No. 3671, May 21, p. 533.
30-cwt. **electro-pneumatic power hammer.** (500 words fig.)

1926 385 .14 (.493) & 656 .235 (.493)
ngineer, No. 3672, May 28, p. 547.
Freight rates in Belgium. (1 500 words & 2 tables.)

1926 62. (01
upplement to the Engineer, No. 3672, May 28, The [Metallurgist, p. 79.
Some practical aspects to the **testing of materials.** 1 200 words.)

1926 656 .257 (.42)
ngineer, No. 3673, June 4, p. 580.
New loop lines between Preston and Carlisle. (1 200 ords & fig.)

1926 621 .331 (.44)
ngineer, No. 3673, June 4, p. 584.
Water-power for the **Paris-Orleans Railway electrification.** (2 200 words & 1 table.)

1926 621 .132.8 (.54)
ngineer, No. 3673, June 4, p. 586.
Bengal-Nagpur Railway « **Garratt** » **locomotive.** (600 ords & fig.)

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1926 621 .87 (01
Engineering, No. 3146, April 16, p. 483.
FEGEHEN (E. G.). — The forces involved in the slewing motion of **power cranes.** (1 900 words, 1 table & fig.)

1926 621 .132.3 (.942) & 621 .132.4 (.942)
Engineering, No. 3146, April 16, p. 491.
4-8-2 type locomotive for the South Australian Railways. (700 words & fig.)

1926 624. (01 (.54)
Engineering, No. 3148, April 30, p. 563.
The **Indian bridge rules.** (2 500 words.)

1926 621 .94 (.73)
Engineering, No. 3148, April 30, p. 573.
HORNER (J.). — American **automatic turning machines.** (1 500 words & fig.)

1926 385 .589 (.42)
Engineering, No. 3149, May 21, p. 597.
The general strike. (1 800 words.)

1926 669 .1
Engineering, No. 3149, May 21, p. 610.
The **heterogeneity of steel ingots.** (2 700 words, 1 table & fig.)

1926 669 .1
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WHITELEY (J. H.). — Ghost lines and the banded structure of **rolled and forged mild steels.** (2 000 words & fig.)

1926 621 .335 (.44)
Engineering, No. 3150, May 28, p. 622.
Express **electric locomotive** for the Midi Railway Company of France. (2 200 words & fig.)

1926 669 .1
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DICKENSON (J. H. S.). — The distribution of silicates in **steel ingots.** (1 800 words, 1 table & fig.)

1926 656 .212.6 (.71)
Engineering, No. 3151, June 4, p. 650.
Dumping plant for grain cars. (3 200 words & fig.)

1926 669 .1
Engineering, No. 3151, June 4, p. 673.
GREAVES (R. H.) & JONES (J. A.). — The ratio of the **tensile strength of steel** to the Brinell hardness number. (1 800 words, 1 table & fig.)

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1926 625 .13 (.73)
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LOEFFLER (H. S.). — **Reinforcing Columbia river bridge** of Great Northern Ry. (2 300 words & fig.)

1926 625 .13 (.73)
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Tunnel driving and shaft sinking in slaking rock. (2 300 words & fig.)

1926 721 .1 (.73)
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PROCTOR (C. S.). — Problems of a deep **caisson-cofferdam foundation**, New York Federal Reserve Bank. (6 500 words & fig.)

1926 624 .2 (01
Engineering News-Record, No. 15, April 15, p. 604.
LAURSON (P. G.). — **Calculation of continuous beams** of variable section. (1 200 words & fig.)

1926 721 .9 (.73)
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Steel trusses carry 22 stories in Chicago Hotel. (2 500 words & fig.)

1926 691
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MERRIMAN (T.). — **Lime-silica index as measure of cement quality.** (2 800 words, 1 table & fig.)

1926 625 .122 (.71) & 691 (.73)
Engineering News-Record, No. 16, April 22, p. 654.
Concrete cribbing for railway retaining walls. (1 600 words & fig.)

1926 691. (01 (.73)
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Cement specifications changed by Missouri Highway Commission. (900 words & fig.)

1926 624 .63
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HAYDEN (A. G.). — Rigid frames in **concrete bridge construction.** (3 000 words & fig.)

1926 62. (01 & 721 .9
Engineering News-Record, No. 17, April 29, p. 698.
Specifying concrete by water-cement ratio alone. (2 600 words & fig.)

1926 62. (01 (.73) & 721 .3 (.73)
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Comparative **tests on concrete piles** in sea water (3 500 words, 3 tables & fig.)

1926 624 .62 (.73)
Engineering News-Record, No. 19, May 13, p. 760.
McCULLOUGH (C. B.). — **Oregon steel arch bridge** erected by cableway. (800 words, 1 table & fig.)

1926 625 .111 (.73)
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Economics of railway relocation and improvement. (1 000 words.)

1926 625 .13 (.73)
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Tunneling dry sand made « live » by passing trains. (1 600 words & fig.)

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CONSTANT (F. H.). — **Old iron bridge transformed** to masonry arch viaduct. (900 words & fig.)

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1926 385 .4
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BURN (D. S.). — Notes on **railway organisation.** (10 000 words.)

1926 656 .237.4 (.42)
Journal, Institute of Transport, May, p. 329.
PRICE (P. H.). — The **Railway Clearing House.** (11 800 words.)

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1926 385. (09.3 (.73)
Loc. Firemen & Enginemen's Mag. May, p. 402.
When plug hats were the style on engines. **Celebration of centennial of chartering of original New York Central Line.** (3 000 words & fig.)

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1926 621 .132.6 (.54)
Loc. Ry. Carr. & Wag. Review, April 15, p. 103.
Tank locomotives for India. Eastern Bengal and Madras & Southern Mahratta Rys. (600 words & fig.)

1926 385. (09.3 (.54)
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The **locomotive history** of the Great Indian Peninsula Railway. (2 400 words & fig.)

1926 625 .616 (.43 + .47)
Loc. Ry. Carr. & Wag. Review, May 15, p. 140.
Narrow gauge locomotives for the Polish State Railways. (1 200 words & fig.)

1926 621 .133.2
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PAWLOWSKI (A. W.). — **Locomotive fire grates** — The removal of clinker, etc. (1 100 words.)

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1926 313: 613 .66 (.73) & 656 .212.6 (.73)
Mechanical Engineering, May, p. 475.
BEYER (D. S.). — **Safety in materials handling.** (9 200 words, 4 tables & fig.)

1926 621 .135.3 & 625 .213
Mechanical Engineering, May, p. 484.
Design and manufacture of **metal springs.** (8 900 words, 4 tables & fig.)

1926 669 .1
echanical Engineering, May, p. 497.
WHITE (A. E.). — Heat-treatment data on quality eel castings. (2 400 words, 2 tables & fig.)

1926 621 .99 (.73)
lechanical Engineering, May, p. 537.
Tentative American standard for wrench-head bolts nd nuts and wrench openings. (750 words & 10 tables.)

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1926 625 .13 (.42)
lodern Transport, No. 368, April 3, p. 5.
Widening of Trent bridge. (750 words & fig.)

1926 656 .1 (.42) & 656 .2 (.42)
lodern Transport, No. 371, April 24, p. 5.
GIBB (R.). — Charges by road and rail. (2 300 words & fig.)

1926 624 .62 (.42)
lodern Transport, No. 371, April 24, p. 9.
The Wearmouth bridge. (1 700 words & fig.)

1926 621 .132.5 (.94) & 621 .132.8 (.94)
Modern Transport, No. 372, May 1, p. 7.
Ten « Mikado » type for south Australia and two « Garratt » type for Victoria. (1 800 words & fig.)

1926 621 .132.8 (.83)
Modern Transport, No. 373-4, May 8 & 15, p. 3.
« Garratt » engines of maximum power for Nitrate Railways. (1 000 words & fig.)

1926 385 .1 (.43)
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BAUMANN. — Administration of the German Railways. (2 300 words.)

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1926 388 (.73)
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MILLER (J. A.). — Increasing the efficiency of passenger transportation in city streets. (3 000 words, 4 tables & fig.)

1926 62. (01 & 721 .4 (01
Proc. Amer. Soc. Civil Eng., May, p. 836.
WHITNEY (C. S.). — Analysis of continuous concrete arch systems. (6 400 words, 13 tables & fig.)

1926 52 .69 (01
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SWEITZER (N. B.). — Field procedure of adjusting the great circle line to the rhumb line. (2 200 words, 1 table & fig.)

1926 625 .111 (.73)
Proc. Amer. Soc. Civil Eng., May, p. 886.
ARMSTRONG (W. R.). — Development of industrial sites and trackage layouts at Kansas City, Kansas, and Los Angeles, California, by the Union Pacific System. (2 400 words & fig.)

1926 62. (01
Proc. Amer. Soc. Civil Eng., May, p. 986.
Notes on shear in compression members. Discussion. (7 600 words & fig.)

1926 721 .3 (01
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Stresses in helically reinforced concrete columns. Discussion. (1 300 words.)

Proceedings, Institution of Mechanical Engineers. (London.)

1925 669 .1
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PEARCE (J. G.). — Cast-iron and modern engineering practice. (4 800 words & 1 table.)

1925 669 .1
Proceed. Institut. of Mech. Eng., No. 6, p. 1243.
FLETCHER (J. E.). — Some applications of research to modern foundry practice. (11 500 words & fig.)

1926 691 (.54)
Proceed. Institut. of Mech. Eng., No. 6, p. 1275.
TEMPLE (F. C.). — Some experiences with the cement gun in India. (2 300 words & fig.)

Proceedings, Institution of Railway Signal Engineers. (Manchester.)

1925-26 656 .25 (01 (.42)
Proceed. Inst. Ry. Signal Eng., Part II, August 1925 [to February 1926, p. 165.
HOLT (G.). — Ministry of transport requirements 1925 and their application to modern signalling practice. (10 000 words.)

1925-26 656 .257
Proceed. Inst. Ry. Signal Eng., Part II, August 1925 [to February 1926, p. 197.
SADLER (W. J.). — Continental practice in the working of points and signals by the compensated double-wire transmission system. (28 000 words & fig.)

1925-26 656 .251
Proceed. Inst. Ry. Signal Eng., Part II, August 1925 [to February 1926, p. 257.
MORGAN (H. E.). & HOOKHAM (F. J.). — Long burning signal lamps. (13 800 words & fig.)

1925-26 656 .254
Proceed. Inst. Ry. Signal Eng., Part II, August 1925 [to February 1926, p. 287.
WOOD (W.). — The construction of aerial, covered, and underground lines as applied to railways. (13 800 words & fig.)

Railway Age. (New York.)

1926 **621 .138.5 (.73) & 725 .33 (.73)**
Railway Age, No. 19, April 10, p. 1001.
Santa Fe completes **reconstruction of coast line shops.** (7 600 words & fig.)

1926 **621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Age, No. 19, April 10, p. 1015.
Delaware & Hudson has well equipped **store department.** (2 000 words, 2 tables & fig.)

1926 **385 .1 (.73)**
Railway Age, No. 19, April 10, p. 1021.
Economic factors in the **railway situation.** (2 900 words & 2 tables.)

1926 **625 .258 (.73) & 656 .259 (.73)**
Railway Age, No. 20, April 17, p. 1058.
Car retarders on Illinois Central. (2 200 words & fig.)

1926 **385 .517.1 (.73)**
Railway Age, No. 20, April 17, p. 1063.
CLARK (J. C.). — Railroad employees' **pension plans.** (5 400 words & 2 tables.)

1926 **625 .143.3**
Railway Age, No. 20, April 17, p. 1067.
SYMINGTON (T. H.). — **Damage to rails** by car wheels. (3 200 words & fig.)

1926 **625 .258 (.73) & 656 .259 (.73)**
Railway Age, No. 20, April 17, p. 1075.
Automatic **self-releasing car retarder.** (400 words & fig.)

1926 **625 .142.2 (.73) & 625 .18 (.73)**
Railway Age, No. 20, April 17, p. 1076.
ROBY (M. A.). — How a road may anticipate its **tie requirements.** (2 000 words & 7 tables.)

1926 **625 .13 (.73)**
Railway Age, No. 21, April 24, p. 1133.
LOEFFLER (H. S.). — Develop ingenious **reinforcement for old bridge.** (2 400 words & fig.)

1926 **625 .251 (.73)**
Railway Age, No. 21, April 24, p. 1141.
Report of **pneumatic brake tests.** (2 200 words & fig.)

1926 **621 .131.3 (.73) & 656 .222.1 (.73)**
Railway Age, No. 21, April 24, p. 1145.
Freight engine makes record run. (1 000 words, 1 table & fig.)

1926 **725 .33 (.73)**
Railway Age, No. 23, May 8, p. 1249.
RAY (G. J.). — Lackawanna builds **modern structure for light car repairs.** (1 000 words & fig.)

1926 **625 .25 (06 (.73)**
Railway Age, No. 23, May 8, p. 1253.
Air brake men convene at New Orleans. (5 300 words.)

1926 **385. (09.1 (.72)**
Railway Age, No. 23, May 8, p. 1265.
CHAMBERS (R.). — Physical condition of **Mexican Railways improving.** (2 900 words & fig.)

1926 **621 .132.5 (.73)**
Railway Age, No. 24, May 15, p. 1295.
Union Pacific **type locomotive.** (2 400 words, 2 tables & fig.)

1926 **625 .3 (.73)**
Railway Age, No. 24, May 15, p. 1305.
Second track project faced unusual difficulties. (3 700 words & fig.)

1926 **656 .253 (.73)**
Railway Age, No. 24, May 15, p. 1317.
OPPELT (J. H.). — Nickel Plate first to install Union intermittent **train stop.** (1 800 words & fig.)

1926 **385 .58 (.73)**
Railway Age, No. 24, May 15, p. 1322.
Labor bill passed by Senate. (2 300 words.)

1926 **621 .116. (06 (.73) & 621 .133.1 (.73)**
Railway Age, No. 24, May 15, p. 1324.
Big attendance at **Fuel Convention.** (6 000 words.)

1926 **624 .8 (.73)**
Railway Age, No. 25, May 22, p. 1363.
PIERCE (P. P.). — Florida East Coast completes **St. Johns River bridge.** (4 600 words & fig.)

1926 **621 .133.1 (06 (.73)**
Railway Age, No. 25, May 22, p. 1377.
Fuel Association completes successful convention (7 000 words & tables.)

1926 **621 .133.2 (.73)**
Railway Age, No. 25, May 22, p. 1392.
Pitkin **articulated staybolt.** (600 words & fig.)

Railway Engineer. (London.)

1926 **625 .1 (.44)**
Railway Engineer, May, p. 163.
Engineering work on the Paris, Lyons & Mediterranean Railway. (2 200 words & fig.)

1926 **656 .253 (.42) & 656 .257 (.42)**
Railway Engineer, May, p. 170.
Colour-light signalling on the Southern Railway. (4 800 words, 1 table & fig.)

1926 **621 .131.3 (.73)**
Railway Engineer, May, p. 181.
Performance of the first **2-8-4 type locomotive** in America. (1 300 words & fig.)

1926 **621 .132.8 (.68)**
Railway Engineer, May, p. 183.
Garratt locomotives for the Rhodesia Railways. (1 000 words & fig.)

721 .9 (.73)
26
way Engineer, June, p. 197.
andardisation of reinforced concrete piles. (1 300
ls & fig.)

625 .1 (.42)
26
way Engineer, June, p. 200.
e Metropolitan and L. N. E. Railways' new line
Vatford. (2 200 words & fig.)

625 .232 (.42)
26
way Engineer, June, p. 209.
ew steel coaching stock, London Midland & Scottish
way. (1 300 words & fig.)

621 .132.5 (.942)
26
way Engineer, June, p. 219.
8-2 freight locomotive, South Australian Railways.
00 words & fig.)

656 .257 (.42)
26
way Engineer, June, p. 221.
ong-distance point operation on the L. M. S. R.
00 words & fig.)

Bulletin, American Railway Engineering Association. (Chicago.)

625 .13 (.73)
926
lway Engineering and Maintenance, April, p. 134.
VILSEY (G. H.). — Lift span complicated bridge
ing project. (2 000 words & fig.)

625 .14 (01
926
lway Engineering and Maintenance, April, p. 137.
IcDONALD (H.). — The effect of various bolt ten-
ns on the strength of joints. (3 000 words.)

385 .586. (01
926
lway Engineering and Maintenance, April, p. 141.
he training of maintenance of way workers brings
ults. (4 000 words.)

621 .16 (.73)
926
lway Engineering and Maintenance, April, p. 144.
ARBOUR (C. M.). — Improvements in power
nts cut fuel costs. (2 600 words & fig.)

625 .13 (.73)
926
lway Engineering and Maintenance, May, p. 177.
Railroad bridge forces erect heavy girder span. (2 500
rds & fig.)

625 .162 (.73)
926
lway Engineering and Maintenance, May, p. 182.
National conference treats of highway crossing pro-
m. (400 words.)

625 .143.5 (.73)
926
lway Engineering and Maintenance, May, p. 183.
Metropolitan Club discusses rail anchors. (2 600
rds.)

625 .17 (.62 + .66)
1926
Railway Engineering and Maintenance, May, p. 185.
PINCKNEY (F. G. A.). — How maintenance of way works is done in Northern Africa. (2 000 words & fig.)

625 .164 (.73)
1926
Railway Engineering and Maintenance, May, p. 187.
Fighting the spring blizzard in the Chicago terminals. (3 400 words & fig.)

625 .123 (.73)
1926
Railway Engineering and Maintenance, May, p. 192.
CULLEN (E. J.). — Culvert pipe 105 ft. long is jacked through 47-ft. fill. (1 500 words & fig.)

313 : 625 .17 (.73)
1926
Railway Engineering and Maintenance, May, p. 194.
Railroad are increasing economy of maintenance work. (1 200 words, 2 tables & fig.)

Railway Gazette & Railway News. (London.)

656 .223.2 (.43 + .44 + .493) & 656 .235 (.43 + .44 + .493)
1926
Railway Gazette & News, No. 16, April 16, p. 549.
SHERRINGTON (C. E. R.). — Coal transport in France, Belgium and Germany. (5 400 words.)

625 .143.5 (.941)
1926
Railway Gazette & News, No. 16, April 16, p. 553.
A new dogspike introduced in Western Australia. (500 words & fig.)

656 .231. (01 (.42)
1926
Railway Gazette & News, No. 16, April 16, p. 554.
ARNOLD (W. C.). — Penny transport. (3 400 words.)

621 .132.3 (.42)
1926
Railway Gazette & News, No. 16, April 16, p. 557.
New 4-4-0 locomotive, Southern Railway. (300 words & fig.)

656 .25 (.42 + .73)
1926
Railway Gazette & News, No. 17, April 23, p. 580.
A comparative survey of American and British signalling. (1 800 words.)

625 .232 (.42)
1926
Railway Gazette & News, No. 17, April 23, p. 582.
New steel coaching stock, London Midland & Scottish Railway. (3 100 words & fig.)

656 .231 (.42)
1926
Railway Gazette & News, No. 17, April 23, p. 593.
Schedules of standard charges. (3 200 words & tables.)

625 .232 (.593)
1926
Railway Gazette & News, No. 18, April 30, p. 615.
Royal sleeping saloon, Siamese State Railways. (1 000 words & fig.)

1926 385 .589 (.42)
Railw. Gaz. & News, Nos. 19 & 20, May 7 & 14, p. 642.
Terms of settlement as between the railway companies on the one hand and the National Union of Railwaymen, Associated Society of Locomotive engineers & Firemen, and the Railway Clerks' Association on the other. (250 words.)

1926 385 .589 (.42)
Railw. Gaz. & News, Nos. 19 & 20, May 7 & 14, p. 643.
Railways and the general strike. (12 000 words & fig.)

1926 621 .132.8 (.83)
Railw. Gaz. & News, Nos. 21 & 22, May 21 & 28, p. 685.
Garratt locomotives for the Nitrate Railways. (750 words & fig.)

1926 621 .131. (01
Railw. Gaz. & News, Nos. 21 & 22, May 21 & 28, p. 689.
Steam locomotive performance, theoretical and actual. (1 900 words.)

1926 621 .33 (.494)
Railw. Gaz. & News. Nos. 21 & 22, May 21 & 28, p. 691.
Railway electrification in Switzerland. (1 700 words.)

1926 385 .589 (.42)
Railw. Gaz. & News, Nos. 21 & 22, May 21 & 28, p. 693.
Railways and the general strike. (4 000 words.)

1926 656 .211 (.42)
Railway Gazette & News, No. 23, June 4, p. 720.
New track lay-out for Cannon Street bridge, S. R. (1 900 words & fig.)

1926 656 .253
Railway Gazette & News, No. 23, June 4, p. 727.
Traffic operation in foggy weather. (1 400 words.)

Railway Magazine. (London.)

1926 656 .211 (.42)
Railway Magazine, May, p. 337.
GAIRNS (J. F.). — **Notable railway stations** and their traffic. (4 300 words & fig.)

1926 621 .131.3 (.42)
Railway Magazine, May, p. 349.
DUMAS (C. K.). — **Testing locomotive engines.** (4 000 words & fig.)

1926 656 .222.1 (.73)
Railway Magazine, May, p. 361.
BAKER (H.). — Express trains in the United States. (3 700 words, 1 table & fig.)

1926 656 .222.1 (.42)
Railway Magazine, May, p. 369 & June, p. 453.
ALLEN (C. J.). — **British locomotive practice and performance.** (10 000 words, 6 tables & fig.)

1926 385 .589 (
Railway Magazine, June, p. 467.
Railways and the strike. (900 words & fig.)

Railway Mechanical Engineer. (New York.)

1926 621 .1
Railway Mechanical Engineer, April, p. 204.
Three-cylinder locomotives discussed by Chic engineers. (5 200 words, tables & fig.)

1926 625 .252.
Railway Mechanical Engineer, April, p. 209.
WILLIAMS (F. H.). — Comparative tests of **iron brake shoes.** (1 500 words, 1 table & fig.)

1926 621 .
Railway Mechanical Engineer, April, p. 212.
REHFUSS (L. A.). — **Future possibilities** of **locomotive boiler.** (2 800 words.)

1926 385. (07
Railway Mechanical Engineer, April, p. 214.
LYFORD (F. E.). — The moral side of appren training. (2 000 words.)

1926 621 .132.7 (.
Railway Mechanical Engineer, April, p. 216.
Texas & Pacific **eight-wheel switchers.** (1 900 wo 1 table & fig.)

1926 625 .
Railway Mechanical Engineer, April, p. 223.
McCUNE (J. C.). — Some fundamentals of the brake. (4 700 words & fig.)

1926 621 .138.5 (.
Railway Mechanical Engineer, April, p. 237.
Repairing locomotives at Pennsylvania Railroad niata shop. (4 000 words, tables & fig.)

1926 621 .335 (.
Railway Mechanical Engineer, May, p. 266.
VAUCLAIN (S. M.).— **Diesel locomotive** possibilit (3 000 words & fig.)

1926 621 .335 (.
Railway Mechanical Engineer, May, p. 272.
Mechanical design of **Virginian electric locomoti** (1 400 words & fig.)

1926 621 .132.3 (.
Railway Mechanical Engineer, May, p. 275.
Compound locomotive for the Italian State R ways. (600 words & fig.)

1926 625 .
Railway Mechanical Engineer, May, p. 277.
O'CONNOR (M. J.). — Lubrication and care of jo nal boxes. (2 000 words & fig.)

1926 725 .45 (09.3 (.
Railway Mechanical Engineer, May, p. 279.
RICHARDSON (G. A.). — Century of car manuf turing progress. (3 500 words & fig.)

1926 625 .251 (.73)
ilway Mechanical Engineer, May, p. 283.
PECK (W. G.). — Preparing trains for the descent grades. (1 600 words.)

1926 621 .138.1 (.73) & 725 .33 (.73)
ilway Mechanical Engineer, May, p. 297.
FEELEY (M. R.). — D. L. & W. engine terminal at mpton. (3 500 words & fig.)

1926 621 .135.5 (.73)
ilway Mechanical Engineer, May, p. 302.
A locomotive air brake feed valve test rack. (1 100 rds & fig.)

Railway Review. (Chicago.)

1926 725 .33 (01
ilway Review, No. 11, March 13, p. 508.
General layout and design of passenger car shops. 900 words & fig.)

1926 656 .212 (.73)
ilway Review, No. 15, April 10, p. 670.
LEWIS (H. M.). — Terminals important in regional anning. (3 700 words & fig.)

1926 625 .258 (.73) & 656 .259 (.73)
ilway Review, No. 15, April 10, p. 674.
Car retarders cut down costs. (3 000 words & fig.)

1926 385 .1 (.73)
ilway Review, No. 15, April 10, p. 679.
Economic factors in the railway situation. (2 700 ords.)

1926 625 .26 (.73)
ilway Review, No. 15, April 10, p. 687.
— — No. 19, May 8, p. 824.
RICE (H. R.). — Station to station car repairs. 6 000 words & fig.)

1926 621 .133.7 (.73)
ilway Review, No. 16, April 17, p. 728.
Tender truck boosters on switch engines. (1 800 ords & fig.)

1926 385 .09.3 (.73)
ilway Review, No. 17, April 24, p. 741.
A hundred years for the New York Central. (4 500 ords & fig.)

1926 625 .123
ilway Review, No. 17, April 24, p. 761.
SHERRON (J. F.). — How to design side ditches or cuts. (500 words & fig.)

1926 621 .132.3 (.73)
ilway Review, No. 17, April 24, p. 763.
Twenty cars at forty miles an hour. (1 800 words, table & fig.)

1926 621 .131.3 (.73)
Railway Review, No. 17, April 24, p. 769.
CAMPBELL (H. A. F.). — Road tests influence locomotives design. (1 500 words & tables.)

1926 625 .13 (.73)
Railway Review, No. 18, May 1, p. 779.
LOEFFLER (H. S.). — Bridge reinforcing under difficulties. (2 300 words & fig.)

1926 625 .18 (.71) & 625 .27 (.71)
Railway Review, No. 18, May 1, p. 784.
LE BLANC (H. P.). — Reclamation of scrap material profitable. (4 800 words & fig.)

1926 656 .212 (.73)
Railway Review, No. 18, May 1, p. 790.
SCARR (F. J.). — Terminal maze controls prosperity. (4 700 words.)

1926 621 .335 (.73)
Railway Review, No. 18, May 1, p. 799.
Motor cars for branch line economy. (2 100 words & fig.)

1926 624 .32 (.51)
Railway Review, No. 18, May 1, p. 802.
New bridge at Kalgan eliminates floods. (2 000 words.)

1926 621 .133.1 (.73)
Railway Review, No. 19, May 8, p. 818.
DALY (M. A.). — Million dollar saving in fuel consumption. (1 900 words & fig.)

1926 725 .33 (.73)
Railway Review, No. 19, May 8, p. 820.
Iselin shop shows good design. (3 300 words & fig.)

1926 621 .132.5 (.73)
Railway Review, No. 19, May 8, p. 827.
Locomotives built to fit traffic needs. (1 200 words & fig.)

1926 656 .28 (01 (.73)
Railway Review, No. 19, May 8, p. 836.
LAFOUNTAINE (C. L.). — Avoiding train and train service accidents. (2 100 words & fig.)

1926 621 .335 (.73)
Railway Review, No. 19, May 8, p. 840.
GARRISON (G. L.). — Oil electric locomotives show economies. (3 500 words & tables.)

1926 621 .132.5 (.73)
Railway Review, No. 20, May 15, p. 857.
U. P. builds largest non-articulated engine. (3 800 words, 1 table & fig.)

1926 656 .224 (.43)
Railway Review, No. 20, May 15, p. 865.
STEAD (A. L.). — Germany attempts to regain lost traffic. (1 200 words & fig.)

1926 **385 .4 (01**
Railway Review, No. 20, May 15, p. 867.
WILSON (J.). — **Proper organization and system of transmitting orders** will strengthen management. (2 000 words & fig.)

1926 **625 .154 (.73)**
Railway Review, No. 20 May 15, p. 873.
CLARKE (H. S.). — **Balanced turntable** replaced with longer twin span in just over four hours. (3 400 words & fig.)

1926 **621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Review, No. 21, May 22, p. 895.
Reclamation saves a million a year. (2 800 words & fig.)

1926 **621 .132.8 (.73)**
Railway Review, No. 21, May 22, p. 911.
SCARRATT (A. W.). — **Automotive train** has mechanical drive. (3 500 words & fig.)

Railway Signaling. (Chicago.)

1926 **625 .258 (.73) & 656 .259 (.73)**
Railway Signaling, April, p. 137.
Electro-peumatic car retarders in service on Illinois Central. (3 000 words & fig.)

1926 **656 .253 (.73)**
Railway Signaling, April, p. 147.
Windmill supplies power for signals on the Great Northern in Montana. (650 words & fig.)

1926 **656 .253 (.73)**
Railway Signaling, April, p. 149.
Train control devices approved on Union Pacific and Missouri Pacific. (4 600 words.)

1926 **656 .253 (.73)**
Railway Signaling, April, p. 152.
Color-light signal and A. C. floating change-over on the Burlington. (1 600 words & fig.)

1926 **656 .253 (.73)**
Railway Signaling, April, p. 155.
Sprague train stop approved on Burlington and Great Northern. (3 800 words.)

1926 **656 .253 (.73)**
Railway Signaling, May, p. 176.
N. Y. C. installs **Miller train stop.** (2 200 words & fig.)

1926 **656 .253 (.73)**
Railway Signaling, May, p. 181.
OPPELT (J. H.). — The Nickel Plate installs the **Union intermittent train stop.** (2 200 words & fig.)

1926 **656 .253 (.73)**
Railway Signaling, May, p. 186.
Pere Marquette first to complete both **train control orders.** (1 400 words & fig.)

1926 **656 .222.4 (.73)**
Railway Signaling, May, p. 189.
SPERRY (H. M.). — **Directing trains** by signals (4 600 words & fig.)

1926 **656 .253 (.73)**
Railway Signaling, May, p. 197.
Three-speed train control on two roads approved (6 200 words.)

South African Railways and Harbours Magazine (Johannesburg.)

1926 **385. (09.1 (.485)**
South African Rys. & Harbours Mag., May, p. 644.
THOMPSON (W.). — The railways of Sweden (4 300 words & fig.)

In Italian.

Annali della Associazione Nazionale degli ingegneri & architetti italiani. (Roma.)

1926 **656 .27**
Ann. Assoc. naz. ing. ital., 25 marzo, p. 48.
REMOTTI (R.). — **Servizi urbani.** Considerazioni sul traffico tramviario. (1 500 parole & fig.)

1926 **331 .1**
Ann. Assoc. naz. ing. ital., 25 marzo, p. 50.
KAMBO (L.). — Il solido del capitale. (3 400 parole & fig.)

Annali dei lavori pubblici. (Roma.)

1925 **625 .144.2 (01 & 625 .144.3 (01**
Annali dei lavori pubblici, luglio, p. 607.
PASINI (A.). — **Il raccordo razionale a curvatura progressiva** nelle ferrovie. (7 800 parole, 2 tabelle & fig.)

1925 **621 .31 (.45)**
Annali dei lavori pubblici, settembre, p. 765.
DE MARCHI (G.). — **La produzione di energia elettrica** in Italia nell'anno 1924. (4 500 parole, tabelle & fig.)

1925 **721 .4 (01**
Annali dei lavori pubblici, settembre, p. 814.
ANDRUZZI (N.). — **L'arco continuo** su appoggi elastici. (3 200 parole & fig.)

1925 **691**
Annali dei lavori pubblici, ottobre, p. 896.
PERIANI (P.). — Notizie sui **cementi alluminosi o cementi fusi.** (5 500 parole & tabelle.)

1925 **624 .52 (.44)**
Annali dei lavori pubblici, ottobre, p. 924.
Ponte sospeso con travata rigida continua a mensole sul fiume Trieux a Lezardrieux (Francia). (2 200 parole, 1 tavole & fig.)

26 624 .61 (.45)
ali dei lavori pubblici, gennaio, p. 26.
UGGERI (D.). — **Il ponte viadotto di Pratentico** zzo) sul canale maestro della Chiana. (2 400 pa- & fig.)

26 721 .9 (01
ali dei lavori pubblici, gennaio, p. 31.
AMERINI (G.). — Grafici per la **determinazione** sezione metallica delle solette e delle travi a T costruzioni di cemento armato. (750 parole & fig.)

26 624 .63 (.45)
ali dei lavori pubblici, marzo, p. 153.
ALLANTINI (U.). — Il ponte ravedis sul torrente na a grande arco in cemento armato. (4 900 parole, vole, 5 tabelle & fig.)

sta delle comunicazioni ferroviarie. (Roma.)

26 656 .211 (.45) & 725 .31 (.45)
delle Comunic. ferrov. n° 9, 1° maggio, p. 15.
ANCHI (E.). — La stazione ferroviaria di Bolo- (3 000 parole & fig.)

26 385. (09.3
delle Comunic. ferrov., n° 10, 15 maggio, p. 18.
INELLI (O.). — La ferrovia nel centenario. (3 900 le.)

26 385 .113 (.45)
delle Comunic. ferrov., n° 11, 1° giugno, p. 15.
bilancio ferroviario del 1926-27. (4 000 parole.)

Rivista delle strade ferrate, autovie e linee di navigazione. (Roma.)

26 355 (.45)
delle str. fer. autov. e linee di nav., gennaio, p. 45.
ferrovie italiane e le necessità militari. (2 400 le.)

26 656 .222.5 (.45)
delle str. fer. autov. e linee di nav., gennaio, p. 51.
conferenza oraria di Milano. (1 100 parole & fig.)

26 621 .33 (09.1 (.45)
delle str. fer. aut. e lin. di nav., febb.-marzo, p. 15.
JALA. — La tramvia elettrica Torino-Settimo nese. (5 000 parole & fig.)

26 385 .1 (.45)
delle str. fer. aut. e lin. di nav., febb.-marzo, p. 25.
ANCASTELLI (U.). — Bilancio, finanza e tariffe Ferrovie dello Stato. (9 800 parole.)

26 656 .253
delle str. fer. aut. e lin. di nav., febb.-marzo, p. 65.
SSIM (R.). — Apparecchio per l'arresto automa- dei treni in corsa. (1 200 parole & fig.)

26 621 .135.2
delle str. fer. aut. e lin. di nav., febb.-marzo, p. 71.
brificazione meccanica delle sale delle locomotive. 0 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1926 621 .134.5
Rivista tecnica delle ferrovie, marzo, p. 73.
CORBELLINI (G.). — Osservazioni pratiche sul loro funzionamento per **distributori e cilindri delle locomotive a vapore.** (1 800 parole, tabelle & fig.)

1926 621 .134.2
Rivista tecnica delle ferrovie, marzo, p. 94.
SALVIA (F.). — Apparecchio per lo studio delle **distribuzioni delle locomotive a vapore.** (3 800 parole & 1 tavole.)

1926 621 .135. (01
Rivista tecnica delle ferrovie, marzo, p. 103.
MACCHIONI (A.). — Contributo allo studio sul **bilanciamento degli effetti prodotti dalle masse dotate di moto alterno nella locomotiva.** (2 300 parole, 1 tabelle & 1 tavole.)

1926 621 .33 (.44)
Rivista tecnica delle ferrovie, marzo, p. 120.
L'elettrificazione parziale della rete della Compagnia d'Orléans in Francia. (600 parole & fig.)

1926 656 .232 (.45)
Rivista tecnica delle ferrovie, 15 aprile, p. 129.
TOSTI (L.). — **Entità del carico merci** sulle Ferrovie dello Stato e sua ripartizione. (2 800 parole, 2 tabelle & fig.)

1926 621 .133.7
Rivista tecnica delle ferrovie, 15 aprile, p. 140.
CORBELLINI (G.). — Esperimenti con **preriscaldatori d'acqua per locomotive.** (11 200 parole, 1 tabelle & fig.)

1926 625 .5 (.83)
Rivista tecnica delle ferrovie, 15 aprile, p. 165.
PILOTTI (F.). — **Il piano inclinato pel trasporto di persone** da Santiago Città al Cerro del S. Cristobal. (1 000 parole & fig.)

Rivista dei trasporti. (Milano.)

1926 625 .172
Rivista dei Trasporti, aprile, p. 61.
Manutenzione meccanica delle massicciate ferroviarie. (900 parole & fig.)

1926 625 .216
Rivista dei Trasporti, maggio, p. 70.
Respingenti rinforzati per veicoli ferroviari. (7 000 parole & fig.)

1926 625 .144.2 (01
Rivista dei Trasporti, maggio, p. 76.
BALATRONI (F.). — Sulla **sopraelevazione della rotaia esterna** nei binari in curva. (1 500 parole & fig.)

In Spanish.

Revista de Obras Publicas. (Madrid.)

1926 625 .13 (.460)

Revista de Obras Públicas, 1° de mayo, p. 248.

MENDIZABAL (D.). — **Sustitución de tramos metálicos y construcción de nuevas pilas de fábrica del puente** sobre el río Segura, situado en el kilómetro 440 990 de la línea de Cartagena. (1 400 palabras, 6 cuadros & fig.)

1926 624 .63 (.460)

Revista de Obras Públicas, 15 de mayo, p. 263.

DE GOYTIA (J. R.). — **El nuevo puente de Torre-Montalvo.** (2 000 palabras & fig.)

1926 624 .63 (01

Revista de Obras Públicas, 1° de junio, p. 291.

DURAN WALKINSHAW (F.). — **Abacos para el cálculo de puentes en arco de hormigón armado.** (1 600 palabras & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1926 536

De Ingenieur, N^r 17, 24 April, p. 321.

VAN ITERSON (F. K. Th.). — **De warmte-övergang** van vaste lichamen op turbulent stroomende vloeistoffen. (9 400 woorden, 4 tafereelen & fig.)

1926 721 .1

De Ingenieur, N^r 19, 8 Mei, p. 380.

SPRENGER (J. J. L.). — **Gewapend beton-opzetters.** (900 woorden & fig.)

1926 656 .284 (.49

De Ingenieur, N^r 20, 15 Mei, p. 389.

VAN BERCKEL (H.). — **Schade aan de spoorweg tengevolge der jongste overstroomingen** en opheffi der daardoor ontstane verkeersstremming. (6 000 wo den & fig.)

1926 625 .61 (.49

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CHEVALLEY (A.). — **Le nouveau silo à alumin** (1 600 mots & fig.)

1926 621 .132.8 (.494

Bull. techn. de la Suisse romande, n° 16, 31 juill., p. 19

Course d'essai d'une **voiture automotrice à benzi** sur la ligne de la Thurgovie centrale (Mittel-Thurga Bahn) les 7 et 8 avril 1926. (400 mots & fig.)

1926 6

Bull. techn. de la Suisse romande, n° 17, 14 août, p. 20

HUBNER (Fr.). — Recherches sur les qualit requises des mélanges de gravier et de sable pour **confection du béton armé et non armé.** (3 300 mo & fig.)

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1926 625 .2

Bull. de la Soc. des ing. civ. de France, mai-juin, p. 27

GRILLE. — **Les wagons à grande capacité à décha** gement automatique. (2 800 mots & fig.)

1926 621 .1

Bull. de la Soc. des ing. civ. de France, mai-juin, p. 31

BERTHELOT (C.). — **L'utilisation des combustibl** minéraux de qualité inférieure. (14 000 mots, 18 t bleaux & fig.)

1926 621 .1

Bull. de la Soc. des ing. civ. de France, mai-juin, p. 37

ORENGO. — **L'emploi du charbon pulvérisé au chau** fage des chaudières à vapeur. (9 600 mots, 3 tablea & fig.)

1926 625 .13 (.4

Bull. de la Soc. des ing. civ. de France, mai-juin, p. 39

LEVY (P.). — **Note sur la démolition des tunne des Batignolles.** (11 200 mots & fig.)

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1926 313 .385 (.46

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Les chemins de fer d'Espagne. (500 mots & tableau

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1926 385 .113 (.43)

ll. de l'Union intern. des ch. de fer, juin, p. 174.

LEVERVE (G.). — Rapport du commissaire des Chemins de fer allemands sur le premier exercice de fonctionnement de la Compagnie (1er octobre 1924-31 décembre 1925.) (9 200 mots, 7 tableaux & fig.)

1926 313 .385 (.47)

ll. de l'Union intern. des ch. de fer, juin, p. 195.

Les Chemins de fer de l'Etat finlandais. (1 300 mots 2 tableaux.)

Génie civil. (Paris.)

1926 621 .14 (.73) & 656 .1 (.73)

énie civil, n° 2288, 19 juin, p. 537.

Les autobus pétroléo-électriques à huit roues du Chigo and Alton Railroad. (2 500 mots & fig.)

1926 625 .251

énie civil, n° 2289, 26 juin, p. 560.

NETTER (J.). — Le freinage continu des trains de archandises. (3 800 mots & fig.)

1926 621 .116 & 621 .133.4

énie civil, n° 2289, 26 juin, p. 569.

Appareil fumivore récupérateur à rampe, système Vinkler. (400 mots & fig.)

1926 621 .331 (.44)

énie civil, n° 2290, 3 juillet, p. 1.

DANTIN (C.). — L'usine hydro-électrique d'Eguzon t l'électrification des Chemins de fer de la Compagnie 'Orléans. (4 900 mots & fig.)

1926 621 .133.2

énie civil, n° 2290, 3 juillet, p. 23.

Chambres d'eau, système Nicholson, pour foyers de ocomotives. (500 mots & fig.)

1926 621 .87

énie civil, n° 2291, 10 juillet, p. 38.

BRAVAIS (F.). — Nouvelle benne automatique à oteur électrique. (1 200 mots & fig.)

1926 624 .63 (.65)

énie civil, n° 2291, 10 juillet, p. 39.

WILLM (F.). — Pont en béton armé sur l'Oued Saf-Saf à Philippeville (Algérie). (900 mots & fig.)

1926 62. (01

énie civil, n° 2292, 17 juillet, p. 53.

PRUDON (G.). — Résistance à l'ovalisation d'une onduite en ciment armé. (900 mots, 2 tableaux & fig.)

1926 621 .43 (.43)

énie civil, n° 2292, 17 juillet, p. 54.

Moteur Diesel de 15 000 ch. installé à l'usine électrique de Neuhof, à Hambourg. (1 200 mots & fig.)

1926 656 .257 (.44)

Génie civil, n° 2293, 24 juillet, p. 69.

DANTIN (C.). — Commande électrique semi-automatique des aiguilles de faisceaux de triage sur le réseau des Chemins de fer de l'Est. (2 000 mots & fig.)

1926 625 .13 (.44)

Génie civil, n° 2293, 24 juillet, p. 83.

La ventilation artificielle du tunnel de Mornay, sur la ligne de Bourg à Bellegarde (Ain). (700 mots & fig.)

1926 621 .43

Génie civil, n° 2294, 31 juillet, p. 89.

Moteur Diesel Worthington à deux temps et à double effet, de 2 900 ch. (1 900 mots & fig.)

1926 621 .338 (.494)

Génie civil, n° 2294, 31 juillet, p. 100.

Truck articulé pour voitures de tramways, de la Fabrique de locomotives de Winterthur. (600 mots & fig.)

1926 624 .63 (.44)

Génie civil, n° 2295, 7 août, p. 109.

CAQUOT (A.). — Pont en béton armé, sur la Canche, à Etaples (Pas-de-Calais). (2 600 mots & fig.)

1926 62. (01

Génie civil, n° 2295, 7 août, p. 112.

SEIGLE (J.). — Nouveaux essais relatifs aux lignes de cession marquant les premières déformations permanentes dans les aciers doux. Cas de barreaux profilés, percés ou non de trous. (4 600 mots & fig.)

1926 62. (01

Génie civil, n° 2296, 14 août, p. 137.

Appareil Fereday-Palmer pour l'enregistrement des efforts dans les constructions métalliques. (1 200 mots & fig.)

1926 621 .116

Génie civil, n° 2296, 14 août, p. 138.

ROUSSELET (R.). — La mesure des débits des conduites au moyen du tube de Venturi. Manomètre différentiel, système Piette. (1 500 mots & fig.)

1926 669

Génie civil, n° 2297, 21 août, p. 161.

SAWINE (N.). — Les résultats comparatifs des diverses méthodes de mesure de la dureté des métaux trempés. (1 200 mots, 2 tableaux & fig.)

La Science et la Vie. (Paris.)

1926 656 .212.6

La Science et la Vie, juillet, p. 46.

LEDOIR (J.). — Des wagons de charbon déchargés par un simple jet d'eau. (1 500 mots & fig.)

1926 621 .392

La Science et la Vie, août, p. 124.

BOLL (M.). — Une révolution dans la soudure autogène grâce à l'hydrogène atomique. (1 500 mots & fig.)

Les chemins de fer et les tramways. (Paris.)

1926 621 .333

Les ch. de fer et les tramw., juillet, p. 104.

BUCHLI (J.). — Un nouveau train moteur pour voiture de tramway. (2 000 mots & fig.)

1926 625 .212 & 625 .214

Les ch. de fer et les tramw., juillet, p. 108.

DESGARDES (E.). — Détermination de l'arc de portée d'un coussinet de boîte à huile sur la fusée de l'essieu. (800 mots, 1 tableau & fig.)

1926 656 .253

Les ch. de fer et les tramw., juillet, p. 113.

Pédale électrique pour crocodile de voie unique. (900 mots & fig.)

1926 621 .134.1 & 621 .392

Les ch. de fer et les tramw., juillet, p. 114.

DEWE (H.). — Réparation des cylindres de locomotives par soudure à la poche. (2 700 mots & fig.)

1926 625 .153 & 656 .253

Les ch. de fer et les tramw., juillet, p. 123.

Lanterne de signal pour traversées jonction-double. (700 mots & fig.)

1926 625 .233

Les ch. de fer et les tramw., août, p. 129.

SPIESS (E.). — L'éclairage des trains par turbo-dynamo. (1 600 mots & fig.)

1926 656 .256.3

Les ch. de fer et les tramw., août, p. 131.

Contrôle de la chute des relais de voie sur les sections de block automatique. (1 200 mots & fig.)

1926 621 .135.3

Les ch. de fer et les tramw., août, p. 132.

Suspension pour bissel arrière de locomotive. (250 mots & fig.)

1926 625 .162 & 656 .259

Les ch. de fer et les tramw., août, p. 133.

La signalisation des passages à niveau. (1 300 mots & fig.)

1926 625 .258

Les ch. de fer et les tramw., août, p. 134.

Dispositif fixe de freinage automatique dans les gares de triage. (1 500 mots & fig.)

1926 625 .143.4 (.44)

Les ch. de fer et les tramw., août, p. 140.

Renforcement de la voie sur le réseau du P. L. M. (300 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1926 621 .336 (.44)

L'Ind. voies ferrées et transp. autom., juin, p. 284.

ALLIAUME. — Exploitation électrique des lignes de tramways. Utilisation des contacteurs commandés à distance. (3 300 mots & fig.)

1926 621 .132.8 (.61) & 621 .43 (.61

L'Ind. voies ferrées et transp. autom., juillet, p. 311.

POULLAIN (L.). — Note sur l'utilisation en Tunisi d'un locotracteur « Diesel électrique ». (2 700 mots & 1 tableau.)

1926 625 .61

L'Ind. voies ferrées et transp. autom., juillet, p. 314.

SCHOPFER (J.). — De l'influence du freinag rhéostatique ou mécanique sur la température des mo teurs de traction (véhicules à voie de 1 mètre). (2 80 mots & fig.)

1926 625 .143.2 & 669 .

L'Ind. voies ferrées et transp. autom., juillet, p. 320.

THIBAUDIER (L.) & VITEAUX (H.). — La ques tion de l'acier à rails et le traitement thermique d Neuves-Maisons. (2 900 mots, tableaux & fig.)

Revue de l'Ecole polytechnique. (Bruxelles.)

1926 621 .163

Revue de l'Ecole polytechnique, juillet, p. 551.

DE PERMENTIER (P.) & BREMER (M.). — Not sur le calcul d'un avant-projet de turbine radiale type Ljüngström. (1 200 mots & fig.)

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1926 625 .13 (.44)

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BOUTEILLER. — Remise en état de la maçonnerie des voûtes et des piles du pont sur l'Aude à Carcassonne (Ligne de Bordeaux à Cette), au moyen d'injections de ciment sous pression. (6 200 mots, 2 tableaux & fig.)

1926 656 .253 (.44)

Revue générale des ch. de fer, juillet, p. 49.

Comparaison des feux clignotants avec les feux fixes pour la signalisation. (1 400 mots & 2 tableaux.)

1926 621 .39

Revue générale des ch. de fer, juillet, p. 52.

Emploi de l'hydrogène atomique pour la soudure par arc électrique. (2 000 mots & fig.)

1926 621 .134.5

Revue générale des ch. de fer, juillet, p. 55.

Graissage des tiroirs et cylindres de locomotives. (1 800 mots & 4 tableaux.)

1926 385 .113 (.44)

Revue générale des ch. de fer, août, p. 119.

Les résultats de l'exploitation des cinq grandes Compagnies de chemins de fer en 1925. (15 800 mots.)

1926 656 .211.5 (.44)

Revue générale des ch. de fer, août, p. 161.

Indicateurs de départ des trains. (2 200 mots & fig.)

1926 621 .132.3 (.460)

Revue générale des ch. de fer, août, p. 168.

Locomotive « Mourtain » du Madrid-Saragosse. (600 mots & fig.)

vue universelle des mines, de la métallurgie, des travaux publics, des sciences et des arts appliqués à l'industrie. (Liége.)

1926 669 .1

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HRUSKA (J. H.). — **Lingots d'acier au nickel-ome produits au four électrique.** (2 500 mots.)

1926 624 .2 (01

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THOMAS (P.). — **Poutres Vierendeel. De la hauteur point d'inflexion sur les montants.** (800 mots & fig.)

1926 669 .1

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LABEYE (F.). — **Notice sur le train « blooming » de Société John Cockerill.** (1 700 mots & fig.)

1926 621 .116

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BOUFFART (M.). — **Un principe essentiel pour la duite scientifique des combustions industrielles.** 200 mots & fig.)

1926 669

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MORESSÉE (G.). — **Refroidissement et chauffage métaux par rayonnement.** (2 200 mots & fig.)

1926 691

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HENRIQUEZ (W.). — **Quelques généralités sur les rres artificielles de construction.** (4 300 mots.)

1926 669 .1

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BERNHARD (F.). — **Comparaison entre le procédé sique S. M. et le procédé Thomas.** (2 000 mots.)

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PIRATH (C.). — **Neuzeitliche Betriebswirtschaft im senbahnbetrieb.** (8 800 Wörter.)

1926 385. (09.1 (.73)

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1926 385 .517 (.43)

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1926 313 .385 (.43)

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1926 313 .385 (.436)

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1926 313 .385 (.45)

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1926 313 .385 (.47)

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1926 313 .385 (.5 +.6 +.7 +.9)

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ROESNER (E.). — **Die Eisenbahnen des englischen Kolonialreichs** in den Jahren 1913, 1920 und 1921. (Tabellen.)

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1926 621 .8

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SELTER. — **Ueber neuere Eisenbahn-Hebewinden.** (4 500 Wörter u. Abb.)

1926 621 .138.1 & 621 .32

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1926 625 .154 & 625 .155

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SCHMELZER. — **Ueber die Bedeutung stetiger Betriebsüberwachung für die Wirtschaftlichkeit elektrischer Schiebebühnen und Drehscheibenantriebe.** (3 000 Wörter, 1 Tabelle u. Abb.)

1926 621 .133.1 (01

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1926 625 .245

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1926 621 .132.8 (.43) & 621 .43 (.43)

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Probefahrt der Dieselgetriebelokomotiven der Hohenzollern A.-G. für Lokomotivbau. (1 500 Wörter u. Abb.)

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1926 625 .62 (.73)

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1926 388 (.73)
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THAYER (E. F.). — **P. R. T. plans to carry 62 000 an hour** at the Sesqui-centennial. (3 000 words & fig.)

1926 621 .33 (.436)
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Austria extends electrification. (2 900 words & fig.)

1926 385 .586 (.73)
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1926 621 .33 (09.1 (.45)
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BIANCHI (G.). — 25 years of **electric operation in Italy.** (2 200 words, 4 tables & fig.)

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DAVIES (C. E.). — « Spread » of metal in **rolling.** (3 500 words, 7 tables & fig.)

1926 669 .1 (06 (.42)
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Iron and steel Institute. (6 000 words & fig.)

1926 621 .335 (.439)
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A single-phase 50- cycle **electric locomotive.** (3 000 words & fig.)

1926 624 .61 (.42)
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New bridge over the Thames at Caversham. (1 000 words & fig.)

1926 62. (01 & 669 .1
The Metallurgist, p. 84, supplement to the Engineer, [No. 3676, June 25.
High silicon **structural steel.** (450 words & 2 tables.)

1926 62. (01 & 669 .1
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The yeld point and cold and warm **brittleness of steel.** (1 600 words, 3 tables & fig.)

1926 625 .13 (.73)
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The **Moffat railway tunnel,** U. S. A. (2 800 words & fig.)

1926 385 .15 (.493)
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The « Industrialisation » of the **Belgian State Railways.** (4 000 words.)

1926 621 .335 (.47) & 621 .43 (.47
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Geared Diesel locomotive for the Russian State Railways. (2 300 words & fig.)

1926 621 .33 (.42
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London Electric Railways : Extensions. The Charing Cross and Kennington. (4 500 words & fig.)

1926 62. (01 (.42) & 621 .9 (.42
Engineer, No. 3681, July 30, p. 115.
1 250-ton **testing machine.** (2 400 words & fig.)

1926 625 .143.2 (
The Metallurgist, supplement to the Engineer, No. 368 [July 30, p. 9
The rail problem. (1 100 words.)

1926 62. (01 & 6
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Safe stresses at high temperatures. (1 500 words & fig.)

1926 621 .94 (.42
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Heavy gap-bed engine lathe. (1 100 words & fig.)

1926 621 .134
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A high-pressure **locomotive lubricator.** (1 200 words & fig.)

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1926 669
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Heterogeneity in **steel ingots.** (1 500 words.)

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SLATER (I. G.) & TURNER (T. H.). — **The hardness of carbon steels** at high temperatures. (1 600 words 1 table & fig.)

1926 669
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PAGE (A. R.). — The hardening and tempering **high-speed steel.** (3 500 words & 1 table.)

1926 624 .61 (.42
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The new **Caversham bridge.** (1 200 words & fig.)

1926 621 .87 (.943) & 656 .212.6 (.943
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20-ton electric coaling transporter at Bowen, Queensland. (1 100 words & fig.)

1926 721 .3 (.71)
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400-ft. reinforced concrete chimney. (1 300 words fig.)

1926 624 .2 (01
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LOVERIDGE (A. W.). — A simple method of dealing th continuous girders. (700 words & fig.)

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Railway wagon weighing tippler. (2 200 words & fig.)

1926 669
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GENDERS (R.). — The interpretation of the macro-ructure of cast metals. (4 300 words & fig.)

1926 62. (01 (.42) & 621 .9 (.42)
ngineering, No. 3159, July 30, p. 134.
1 250-ton universal testing machine. (3 000 words fig.)

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BASQUIN (O. H.). — Observed stress distribution in eb of I-beam. (1 700 words & fig.)

1926 725 .32 (.73)
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Warehouse embodies latest industrial building design. 3 800 words & fig.)

1926 721 .1 (.73)
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PRITCHARD (J. C.). — Underwater piledriving and offerdam sealing. (1 800 words & fig.)

1926 691
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KOBBE (W. H.). — Strengthening and indurating oncrete with sulphur. (2 300 words & fig.)

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New York's third subway under construction. (8 600 words, 2 tables & fig.)

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KING (C. R.). — Concrete bridge designed for elastic movement. (1 500 words & fig.)

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Crossing elimination and road relocation in Califor-nia. (2 500 words & fig.)

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SEIBERT (C. J.). — Overcrossing bridge dismantled on suspension supports. (700 words & fig.)

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1926 625 .1 (09.1 (.67)
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COCK (H. G.). — The Tanganyika railway and its permanent way. (3 000 words, 3 tables & fig.)

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Petrol auto-cars on the Dutch Railways. (2 100 words & fig.)

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1926 621 .116 (.73)
Mechanical Engineering, June, p. 583.
WHAREN (G. B.). — The economic use of **North Dakota lignite for steam generation.** (2 600 words & fig.)

1926 621 .335 (.73)
Mechanical Engineering, June, p. 585.
The Diesel-electric locomotive and its relation to heavy electrification. (6 300 words.)

1926 621 .39
Mechanical Engineering, June, p. 603.
HOHN (E.). — **Autogenously and electrically welded boilers** and containers. (3 300 words, 10 tables & fig.)

1926 536
Mechanical Engineering, June, p. 610.
What is known today regarding the nature of **heat transmission.** (2 700 words & fig.)

Modern Transport. (London.)

1926 624 (.42)
Modern Transport, Nos 373-374, May 8 and 15, p. 6.
The problem of **Thames bridges.** (4 400 words.)

1926 625 .4 (.42) & 621 .33 (.42)
Modern Transport, No. 379, June 19, p. 15.
Underground railway extensions in south London. (1 800 words & fig.)

1926 385. (09.1 (.42 +.73)
Modern Transport, No. 380, June 26, p. 3.
BELL (R.). — **British and American Railways.** Development and operating methods. (3 300 words & fig.)

1926 659 (.42)
Modern Transport, No. 380, June 26, p. 22.
TEASDALE (W. M.). — Railway advertising. Methods on the L. N. E. R. (2 200 words & fig.)

1926 621 .7 (.42)
Modern Transport, No. 380, June 26, supplement p. 11.
Mass production of **railway rolling stock.** (4 000 words & fig.)

1926 656 .212.6 (.42)
Modern Transport, No. 380, June 26, supplement p. 19.
L. M. S. R. facilities in Birmingham. **Electric truck working** at Curzon Street goods station. (2 800 words & fig.)

1926 625 .232 (.62)
Modern Transport, No. 382, July 10, p. 3.
Passenger travel innovation on Egyptian Railways. (1 200 words & fig.)

1926 621 .335 (.42)
Modern Transport, No. 382, July 10, p. 15.
Increased comfort in **tramcars.** (1 300 words & fig.)

1926 621 .335 (.81)
Modern Transport, No. 384, July 24, p. 5.
Electric locomotive for Brazil. (800 words & fig.)

1926 621 .138.1 (.42) & 725 .33 (.42
Modern Transport, No. 385, July 31, p. 3.
Southern Railway improvements in the West Country. New **locomotive and other dépôts** at Exmouth Junction. (3 300 words & fig.)

1926 621 .33 (.42
Modern Transport, No. 387, August 14, p. 3.
More **Southern lines to be electrified.** (1 000 words & fig.)

1926 625 .61 (.42
Modern Transport, No. 387, August 14, p. 4.
Light railway for Kent. (1 000 words & fig.)

1926 625 .4 (.42
Modern Transport, No. 387, August 14, p. 5.
Stripping a tube during traffic. (700 words & fig.)

Proceedings, American Railway Association. (Signal Section.) (New York.)

1926 656 .257 (.73)
Amer. Ry. Ass^{on}, Signal Section, Vol. XXIV, Aug., p. 5
Committee III — **Power interlocking.** (5 500 words & fig.)

1926 625 .162 (.73)
Amer. Ry. Ass^{on}, Signal Section, Vol. XXIV, Aug., p. 30
Special Committee — **Highway crossing protection** (3 000 words & fig.)

1926 656 .253 (.73)
Amer. Ry. Ass^{on}, Signal Section, Vol. XXIV, Aug., p. 39
Committee X — **Signaling practice.** (2 500 words & fig.)

1926 656 .257 (.73)
Amer. Ry. Ass^{on}, Signal Section, Vol. XXIV, Aug., p. 61
Committee II. — **Mechanical interlocking.** (7 900 words.)

Proceedings, American Society of Civil Engineers. (New York.)

1926 624 .2
Proceed., Amer. Soc. Civil Eng., August, p. 1106.
MYERS (B. S.). — Distribution of **reinforcing steel in concrete beams and slabs.** (4 400 words & fig.)

1926 62. (01 & 721 .3
Proceed., Amer. Soc. Civil Eng., August, p. 1148.
GRIFFITH (J. H.), TUCKER (J.) & FELD (J.). — **Stresses in helically reinforced concrete columns.** (6 900 words & fig.)

1926 624 .2
Proceed., Amer. Soc. Civil Eng., August, p. 1228.
GEDO (J. D.). — **Moments in restrained and continuous beams** by the method of conjugate points. (2 200 words, 4 tables & fig.)

1926 691
Proceed., Amer. Soc. Civil Eng., August, p. 1267.
Corrosion of concrete. (3 500 words & fig.)

Railway Age. (New York.)

1926 385. (08 (.73)
ilway Age, No. 19, April 10, p. 1011.
Pennsylvania's excellent report. (3 000 words, 1 table fig.)

1926 621 .138.1 (.73) & 725 .33 (.73)
ilway Age, No. 22, May 1, p. 1197.
Grand Trunk Western builds modern terminal at ttle Creek. (2 800 words & fig.)

1926 621 .132.8 (.73)
ilway Age, No. 22, May 1, p. 1203.
SCARRATT (A. W.). — A new development in wer rail cars. (2 600 words & fig.)

1926 625 .143. (01
ilway Age, No. 22, May 1, p. 1223.
Will strong track construction reduce maintenance penses? (900 words.)

1926 656 .251 (.73)
ilway Age, No. 26, May 29, p. 1436.
Color-position-light signals on the D. T. & I. (400 rds & fig.)

1926 621 .13 (01 & 621 .335. (01
ilway Age, No. 26, May 29, p. 1441.
PECK (H. S.). — Steam versus electric motive power. 700 words & fig.)

1926 625 .141
ilway Age, No. 26, May 29, p. 1447.
HALE (H. E.). — How grading material and ballast ange in volume. (700 words & fig.)

1926 385 .51 (.73)
ilway Age, No. 27, June 5, p. 1485.
SNOW (F.). — Substantial progress in co-operation. 000 words.)

1926 621 .133.7
ilway Age, No. 31, June 12, p. 1667.
The past, present and future of water treatment. 000 words.)

1926 621 .132.5 (.73)
ilway Age, No. 31, June 12, p. 1673.
BLANCHARD (H.). — Service of simple Mallets. 000 words, 3 tables & fig.)

1926 656 .253 (.73)
ilway Age, No. 31, June 12, p. 1683.
New York Central equips engines for train stop. 200 words & fig.)

1926 621 .131.3 (.73) & 621 .137.1 (.73)
ilway Age, No. 37, June 19, p. 1903.
Engine operation standardized by pressure gages. 600 words & fig.)

1926 625 .17 (.73) & 625 .18 (.73)
ilway Age, No. 37, June 19, p. 1907.
HARSHA (B. D.). — Controlling expenditures for aintenance. (1 800 words & fig.)

1926 657. (06 (.73)
Railway Age, No. 37, June 19, p. 1911.
Railway accounting officers meet. (10 500 words & fig.)

1926 385 .573 (.73) & 385 .58 (.73)
Railway Age, No. 37, June 19, p. 1919.
JOHNSTON (C. E.). — More attention to maintenance labor will yield results. (2 400 words & fig.)

1926 385. (06 (.73)
Railway Age, No. 37, June 19, p. 1921.
Superintendents meet at Montreal. (19 000 words.)

1926 656 .24
Railway Age, No. 37, June 19, p. 1933.
Freight claim division meets at Norfolk. (2 300 words, 1 table & fig.)

1926 625. (01 (.73)
Railway Age, No. 38, June 26, p. 1952.
HALLIHAN (J. P.). — Grade separation in relation to city planning. (3 000 words & fig.)

1926 625 .244 (.73)
Railway Age, No. 38, June 26, p. 1956.
Divided basket bunkers save ice. (3 400 words & fig.)

1926 385 .589 (.42)
Railway Age, No. 38, June 26, p. 1961.
WEDGWOOD (Sir Ralph-L.). — The railway strike in Great Britain. (4 500 words.)

1926 385 .3 (.73) & 347 .7 (.73)
Railway Age, No. 38, June 26, p. 1965.
THOM (A. P.). — Legal aspects of consolidation. (4 400 words.)

1926 621 .132.3 (.43)
Railway Age, No. 38, June 26, p. 1969.
Multiple pressure locomotive tested in Germany. (1 000 words, 1 table & fig.)

1926 656 .1 (.73) & 656 .2 (.73)
Railway Age, No. 38, June 26, p. 1981.
N. E. T.'s operations growing rapidly. (3 200 words, 1 table & fig.)

1926 385 .575 (.73)
Railway Age, No. 1, July 3, p. 10.
STEVENS (D. F.). — Transportation and the car man. (3 600 words.)

1926 621 .33 (.73)
Railway Age, No. 4, July 24, p. 129.
Electrification of I. C. suburban service completed. (6 700 words & fig.)

1926 621 .335 (.47) & 621 .43 (.47)
Railway Age, No. 4, July 24, p. 139.
WITTKUHNS (E. E.). — Gear transmission for Diesel engine. (1 900 words & fig.)

1926 625 .3 (.73)
Railway Age, No. 4, July 24, p. 147.
RYAN (W. J.). — How logging railroads are built and operated. (3 400 words & fig.)

1926 621 .14 (.73) & 656 .1 (.73)
Railway Age, No. 4, July 24, p. 153.
Buses replace trains on N. C. & St. L. branch. (2 900 words & fig.)

Railway Engineer. (London.)

1926 621 .132.8 (01
Railway Engineer, July, p. 233.
JONES (G. F.). — The development of the turbo-condensing locomotive. (5 700 words & fig.)

1926 621 .131.1
Railway Engineer, July, p. 240.
Chart for tractive effort of locomotives. (700 words & fig.)

1926 621 .132.8 (.54)
Railway Engineer, July, p. 245.
Articulated steam rail coaches, Bengal-Nagpur Railway. (600 words & fig.)

1926 621 .132.3 (.42)
Railway Engineer, July, p. 248.
« King Arthur » class 4-6-0 locomotives, Southern Railway. (400 words & fig.)

1926 621 .134.5
Railway Engineer, July, p. 252.
A new high-pressure mechanical lubricator for locomotives. (2 600 words & fig.)

1926 625 .14 (.44)
Railway Engineer, August, p. 275.
Permanent way reconstruction on the Northern Railway of France. (1 900 words & fig.)

1926 621 .132.3 (.43) & 621 .132.5 (.43)
Railway Engineer, August, p. 279.
Standard locomotives for the German State Railways. (2 000 words & fig.)

1926 621 .133.8 (01
Railway Engineer, August, p. 290.
Valve diagrams for locomotives. (1 500 words & fig.)

Railway Engineering & Maintenance. (Chicago.)

1926 385 .573 (.73) & 625 .1 (.73)
Railway Engineering & Maintenance, June, p. 218.
Is it practicable to increase amount of winter work? (4 900 words & fig.)

1926 625 .13 (.73)
Railway Engineering and Maintenance, June, p. 223.
CRAMER (F. H.). — Two unusual erection schemes. (2 800 words & fig.)

1926 385 .51 (.73
Railway Engineering & Maintenance, June, p. 227.
JOHNSTON (C. E.). — Labor and its supervisio (3 800 words & fig.)

1926 725 .33 (.73
Railway Engineering & Maintenance, June, p. 230.
Illinois Central builds an automatic water supp station. (3 200 words & fig.)

1926 625 .123 (.73
Railway Engineering & Maintenance, June, p. 260.
SAVAGE (P. T.). — Illinois Central installs lar mileage of track drainage. (2 000 words & fig.)

1926 625 .13 (.73
Railway Engineering & Maintenance, July, p. 263.
BERNHARDT (J. E.). — Chicago & Eastern Illino raises bridge by a novel method. (1 300 words & fig

1926 625 .111 (.73
Railway Engineering & Maintenance, July, p. 270.
Illinois Central moves long platforms 39 ft. 10 hours. (2 800 words & fig.)

1926 625 .143.3 (.73
Railway Engineering & Maintenance, July, p. 273.
Rail Committee states position on transverse fi sures. (2 400 words, 4 tables & fig.)

1926 625 .142.2 (.73
Railway Engineering & Maintenance, July, p. 279.
Committee on forest products of A. R. A. recommen form. (1 600 words, 1 table & fig.)

1926 625 .142.2 (.73) & 691 (.73
Railway Engineering & Maintenance, July, p. 282.
CHURCH (S. R.). — A plea for more general use a creosote-coal tar solution. (2 000 words & fig.)

1926 625 .143.3 (.73
Railway Engineering & Maintenance, August, p. 30
How the Illinois Central watches its transverse fi sures. (5 900 words & fig.)

1926 625 .18 (.73
Railway Engineering & Maintenance, August, p. 308.
Burlington systematizes handling of its bridge m terials. (3 000 words & fig.)

Railway Gazette & Railway News. (London.)

1926 621 .33 (.42
Railway Gazette & News, No. 24, June 11, p. 751.
The world's greatest suburban electrification. (2 4 words, 1 table & fig.)

1926 385 .589 (.42
Railway Gazette & News, No. 24, June 11, p. 761.
The general strike and its effects on the L. M. S. (3 200 words.)

1926 621 .335 (.49
Railway Gazette & News, No. 25, June 18, p. 783.
New electric express locomotives, Swiss Federal Ra ways. (500 words & fig.)

926 656 .212.6 (.42)
lway Gazette & News, No. 25, June 18, p. 785.
etrol-electric **mobile crane.** (1 000 words & fig.)

926 625 .143.4
lway Gazette & News, No. 25, June 18, p. 788.
ridge plates for **rail joints.** (1 200 words & fig.)

926 621 .133.1 (.42)
lway Gazette & News, No. 25, June 18, p. 793.
il-fired **locomotives** on the L. M. S. R. (700 words ig.)

926 625 .1 (.44)
lway Gazette & News, No. 26, June 25, p. 815.
ermanent way reconstruction on the Northern Rail- of France. (1 700 words & fig.)

926 625 .212
lway Gazette & News, No. 2, July 9, p. 49.
Iot boxes. (1 900 words & fig.)

926 621 .132.5 (.73)
ilway Gazette & News, No. 3, July 16, p. 74.
A new type of locomotive in America. (500 words ig.)

926 621 .7 (.54)
ilway Gazette & News, No. 3, July 16, p. 77.
ndian State Railways **workshops.** (7 600 words & tables.)

926 625 .61 (.42)
ilway Gazette & News, No. 4, July 23, p. 107.
Light railways for potato traffic in south — east ncolnshire. (600 words & fig.)

926 625 .173 (.42)
ilway Gazette & News, No. 4, July 23, p. 110.
A notable **permanent way** undertaking on the L. M. R. (500 words & fig.)

926 385 .51 (.71)
ilway Gazette & News, No. 4, July 23, p. 112.
Co-operation on the **Canadian National Railways.** 000 words.)

926 621 .335 (.81)
ilway Gazette & News, No. 5, July 30, p. 136.
100-ton **electric locomotive** for the Paulista Railway. 300 words & fig.)

926 385. (09.3 (.73)
ilway Gazette & News, No. 5, July 30, p. 141.
Centenary of the New York Central Railroad. (2 300 rds & fig.)

926 625 .245 (.42)
ilway Gazette & News, No. 5, July 30, p. 142.
80-ton **trolley wagon,** L. M. S. R. (400 words & fig.)

926 621 .132.8 (.42)
ilway Gazette & News, No. 6, August 6, p. 170.
New 2-6-0 **type mixed-traffic superheater locomo-** e, London Midland & Scottish Railway. (400 words fig.)

1926 625 .1 (.44)
Railway Gazette & News, No. 6, August 6, p. 172.
Engineering work on the P. L. M. Railway, France. (1 900 words & fig.)

1926 625 .11 (.51)
Railway Gazette & News, No. 6, August 6, p. 176.
Railway development in northern China. (1 300 words & fig.)

1926 625 .245 (.42)
Railway Gazette & News, No. 6, August 6, p. 182.
Improvements in railway **tipping wagons.** (200 words & fig.)

Railway Magazine. (London.)

1926 385. (09.1 (.93)
Railway Magazine, July, p. 13.
TRAVIS (C.). — The **State Railways of Australasia.** (5 500 words, 1 table & fig.)

1926 656 .222.1 (.42)
Railway Magazine, July, p. 35.
— — August, p. 127.
ALLEN (C. J.). — **British locomotive practice and performance.** (10 900 words, 3 tables & fig.)

Railway Mechanical Engineer. (New York.)

1926 625 .26 (.73) & 725 .33 (.73)
Railway Mechanical Engineer, June, p. 340.
Wabash builds **steel car shop** at Decatur. (1 800 words & fig.)

1926 621 .138.1 (.73) & 725 .33 (.73)
Railway Mechanical Engineer, June, p. 344.
Pennsylvania East Altoona **engine terminal.** (2 400 words, 1 table & fig.)

1926 621 .95
Railway Mechanical Engineer, June, p. 351.
GURLEY (L. R.). — The drilling machine in the railway shop. (5 900 words & fig.)

1926 621 .9 (.73)
Railway Mechanical Engineer, June, p. 359.
KINSEY (O. D.). — **System tool room** on C. M. & St. P. (1 500 words & fig.)

1926 621 .138.5 (.73) & 725 .33 (.73)
Railway Mechanical Engineer, June, p. 362.
A. T. & S. F. **San Bernardino locomotive shops.** (4 200 words, 1 table & fig.)

1926 621 .7 (.73)
Railway Mechanical Engineer, June, p. 371.
KOSCHINSKE (E. A.). — D. L. & W. has effective **scheduling system.** (2 300 words, 1 table & fig.)

Railway Review. (Chicago.)

1926 **656 .212 (.73) & 656 .1 (.73)**
Railway Review, No. 22, May 29, p. 937.
BOYD (G. E.). — Trucks simplify terminal operation. (4 700 words & fig.)

1926 **621 .14 (.73) & 656 .1 (.73)**
Railway Review, No. 22, May 29, p. 943.
PAUL (L. C.). — Gas electric coaches built for C. & A. (2 700 words & fig.)

1926 **621 .133.3 & 669 .1**
Railway Review, No. 23, June 5, p. 977.
BARR (W. M.). — A study into causes of pitting and corrosion in locomotive boilers. (5 000 words & fig.)

1926 **621 .138.1 (.71) & 725 .33 (.71)**
Railway Review, No. 23, June 5, p. 985.
Grand Trunk builds new engine terminal. (2 300 words & fig.)

1926 **625 .244 (.73)**
Railway Review, No. 23, June 5, p. 993.
ALEXANDER (W.). — New refrigerator car design is successful. (2 000 words, tables & fig.)

1926 **625 .251 (.73)**
Railway Review, No. 23, June 5, p. 999.
Investigation made of brake pipe leakage. (5 300 words & fig.)

1926 **725 .33 (.73)**
Railway Review, No. 23, June 5, p. 1009.
Wabash builds new freight car repair shops. (1 400 words & fig.)

1926 **621 .133 (.73)**
Railway Review, No. 23, June 5, p. 1035.
Improvements in locomotive economy devices. (4 700 words & fig.)

1926 **621 .133.3 (.73), 669 .1 (.73) & 621 .133.7 (.73)**
Railway Review, No. 23, June 5, p. 1041.
Pitting, corrosion, and locomotive failures also discussed at Boiler Makers' Convention. (4 500 words & 6 tables.)

1926 **621 .133.2 (.73) & 621 .133.4 (.73)**
Railway Review, No. 23, June 5, p. 1045.
The care of front ends, grates and ashpans. (3 500 words & fig.)

1926 **621 .133.3 (.73)**
Railway Review, No. 24, June 12, p. 1061.
New type boiler on a three cylinder engine. (2 900 words, 1 table & fig.)

1926 **669 .1**
Railway Review, No. 24, June 12, p. 1075.
RESSLER (C. T.). — How wrought iron is manufactured. (2 600 words & fig.)

1926 **625 .244 (.7**
Railway Review, No. 24, June 12, p. 1081.
North Shore runs iceless refrigerator cars. (1 0
words & fig.)

1926 **621 .13 (01 & 621 .335. (**
Railway Review, No. 24, June 12, p. 1101.
PECK (H. S.). — Operating factors in fuel econon
(3 400 words & fig.)

1926 **624 .51 (.7**
Railway Review, No. 24, June 12, p. 1103.
WILLIAMS (R. B.). — New Delaware river brid
(1 000 words & fig.)

1926 **621 .13**
Railway Review, No. 24, June 12, p. 1105.
LANNING (H. H.). — How to improve locomoti
efficiency. (6 500 words.)

1926 **614 .8 (.73) & 656 .28 (.7**
Railway Review, No. 25, June 19, p. 1129.
CARROW (T. H.). — Progress and possibilities
safety. (2 200 words.)

1926 **621 .1**
Railway Review, No. 25, June 19, p. 1132.
How to increase locomotive mileage. (4 600 word

1926 **385. (06**
Railway Review, No. 25, June 19, p. 1136.
Mechanical division committee reports. Nearly eve
possible subject dealt with at the Atlantic City Co
vention. (23 400 words & fig.)

1926 **625 .26 (.7**
Railway Review, No. 25, June 19, p. 1166.
Southern Railway coordinates car repairs. (2 3
words & fig.)

Railway Signaling. (Chicago.)

1926 **656 .253 (.7**
Railway Signaling, June, p. 217.
ELSWORTH (R. B.). — New York Central complet
New signal power line. (2 600 words & fig.)

1926 **656 .2**
Railway Signaling, June, p. 224.
McCARTHY (D. J.). — Scientific study of lig
signals. (5 800 words & fig.)

1926 **625 .162 (.73) & 656 .254 (.7**
Railway Signaling, June, p. 229.
MILLISON (D. J.). — Extensive grade crossing pr
tection installed on Pennsylvania. (1 600 words & fig

1926 **656 .253 (.42) & 656 .257 (.4**
Railway Signaling, June, p. 234.
THORROWGOOD (W. J.). — Four-aspect color-lig
signals installed on English road. (3 800 words & fig

1926 656 .25 (.73)

Railway Signaling, July, p. 257.

Signal maintenance on the Erie. (4 300 words, tables & fig.)

In Italian.

Annali della Associazione Nazionale degli ingegneri & architetti italiani. (Roma.)

1926 385 .1

Ann. Assoc. naz. ing. ital., 25 maggio, p. 91.

KAMBO (L.). — La rendita e il salario. (3 200 parole & fig.)

Annali dei lavori pubblici. (Roma.)

1926 624 .2 (01

Annali dei lavori pubblici, Aprile, p. 330.

SUPINO (G.). — La teoria della resistenza dei materiali in confronto con acuni risultati della statica elastica. (3 500 parole, 1 tabelle & fig.)

1926 621 .132.8 & 621 .43

Annali dei lavori pubblici, maggio, p. 420.

Il motore a combustione interna negli impieghi di trazione. (2 500 parole & fig.)

1926 625 .258 & 656 .259

Annali dei lavori pubblici, maggio, p. 427.

Le stazioni di smistamento e i freni di rotaie. (2 600 parole & fig.)

Rivista delle comunicazioni ferroviarie. (Roma.)

1926 625 .232 (.45)

Riv. delle Comunic. ferrov., n° 15, 1° agosto, p. 16.

Le nuove carrozze a letto di costruzione italiana. (1 700 parole & fig.)

1926 656 .211.7 (.45)

Riv. delle Comunic. ferrov., n° 16, 15 agosto, p. 13.

I « ferry-boats » nello stretto di Messina. (1 900 parole & fig.)

Rivista delle strade ferrate, autovie e linee di navigazione. (Roma.)

1926 621 .132.8

Riv. delle str. fer. autov. e linee di nav., apr.-mag., p. 39.

BALDINI (U.). — Locomotori a nafta. (3 900 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1926 614 .5 (.45)

Revista tecnica delle ferrovie, 15 maggio, p. 214.

MARTIRANO (F.) & TOGNETTI (A.). — La tuberculosi nelle Ferrovie dello Stato. (3 700 parole & 7 tabelle.)

1926 625 .2 (01 & 656 .281. (01

Revista tecnica delle ferrovie, 15 maggio, p. 224.

GIOVENE (N.). — Per lo studio degli svii oscillazioni, effetti d'inerzia e giroscopici del materiale rotabile. (2 600 parole.)

1926 625 .232 (.45)

Revista tecnica delle ferrovie, 15 giugno, p. 237.

VIGLIONE (O.). — Le nuove carrozze con letti e carrozze ristorante della Compagnia Internazionale delle carrozze con letti e dei grandi treni espressi Europei. (4 600 parole & fig.)

1926 656 .225 (.45)

Revista tecnica delle ferrovie, 15 giugno, p. 258.

TOSTI (L.). — Principali caratteristiche del servizio merci sulle Ferrovie dello Stato. (3 700 parole, tabelle & fig.)

1926 625 .122

Revista tecnica delle ferrovie, 15 giugno, p. 274.

MADDALENA. — Studio Geognostico del tratto di linea tra Nera Montoro e Narni in relazione al pericolo della caduta di massi. (1 200 parole & fig.)

1926 656 .223.2

Revista tecnica delle ferrovie, 15 giugno, p. 282.

BELMONTE. — Sulla questione dei carri privati in servizio internazionale. (2 100 parole.)

1926 025 .4 & 385

Revista tecnica delle ferrovie, 15 giugno, p. 287.

GIOVENE (N.). — Per la documentazione industriale. (1 900 parole.)

Rivista dei trasporti. (Milano.)

1926 621 .132.8 & 621 .43

Revista dei Trasporti, giugno, p. 86.

BALDINI (U.). — Automotrici ferroviarie con motore a scoppio. (6 900 parole.)

In Spanish.

Gaceta de los Caminos de hierro. (Madrid.)

1926 385 .15 (.4)

Gaceta de los Caminos hierro, n° 3482, 10 de julio, p. 229.

SALVADOR (E. N.). — Los ferrocarriles de Europa y su nacionalización. (1 700 palabras & 1 cuadro.)

1926 385 .589 (.42)

Gaceta de los Cam. hierro, n° 3484, 1° de agosto, p. 253.

Preparación de la huelga general é intervención de los sindicatos ferroviarios en la misma. (2 100 palabras.)

Revista de Obras Publicas. (Madrid.)

1926 691 (.460)

Revista de Obras Públicas, nº 12, 15 de junio, p. 297.

Recalzo de cimientos con ataguias de hormigón armado. (400 palabras & fig.)

1926 725 .33

Revista de Obras Públicas, nº 12, 15 de junio, p. 298.

CEBALLOS PABON (R.). — El taller central de Via y obras de la Compañia de M. Z. A. (1 800 palabras & fig.)

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1926 **313 .385 (.675)**
Archiv für Eisenbahnwesen, Heft 5, Sept.-Okt., S. 1197.
Eisenbahnen und Schiffahrt in der belgischen Kongokolonie in den Jahren 1923 und 1924. (500 Wörter u. Tabellen.)

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1926 **625 .232 (.485)**
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D-Zug-Wagen für die Ostkustbanans Aktiebolag Gävle. (650 Wörter & fig.)

1926 **625 .112 (.43 + .47)**
Glasers Annalen, Heft 5, 1. September, S. 61.
NEUBERT.— Der **Umsetzverkehr** zwischen russischen Breitspurbahnen und Regelspurbahnen. (2 500 Wörter & Abb.)

1926 **621 .135. (01 & 621 .335**
Glasers Annalen, Heft 6, 15. September, S. 82.
EVERS (W.). — **Veränderungen der Achsdrücke und Tragfederbelastungen** durch die ausgeübte Zugkraft bei elektrischen Lokomotiven mit wagerechtem Zahnradantrieb. (2 700 Wörter u. Abb.)

1926 **385 .113 (.43)**
Glasers Annalen, Heft 6, 15. September, S. 86.
Aus dem **Geschäftsbericht der Deutschen Reichsbahn-Gesellschaft** über das Geschäftsjahr 1925. (1 900 Wörter u. 1 Tabelle.)

In English.

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1926 **625 .141 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, July, p. 7.
Committee II. — **Ballast.** (600 words.)

1926 **625 .142.2 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, July, p. 9.
Committee III. — **Ties.** (3 200 words.)

1926 **625 .143 (.73)**
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Committee IV. — **Rail.** (3 600 words & fig.)

1926 **625 .143 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, July, p. 33.
Committee V. — **Track.** (2 600 words & fig.)

1926 **725 .3 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, July, p. 41.
Committee VI. — **Buildings.** (12 400 words & fig.)

Electric Railway Journal. (New York.)

1926 **621 .338 (.73)**
Electric Railway Journal, No. 26, June 26, p. 1086.
New **light-weight equipment pays.** Lower car prices are possible. (8 000 words, 5 tables & fig.)

1926 **385 .586 (.73) & 621 .33 (.73**
Electric Railway Journal, No. 26, June 26, p. 1105.
SEGARD (C. P.). — **Improved training for platform** men on Third Avenue System. (2 200 words, 1 tab & fig.)

1926 **621 .331 (.73**
Electric Railway Journal, No. 2, July 10, p. 53.
BELL (H. P.). — **Key System Transit Company** com pletes 1 500-Kw. substation. (1 800 words & fig.)

1926 **621 .338 (.42) & 625 .4 (.42**
Electric Railway Journal, No. 2, July 10, p. 57.
Extensive modernization program for **London Under ground.** (2 400 words & fig.)

1926 **621 .33 (.73) & 625 .251 (.73**
Electric Railway Journal, No. 3, July 17, p. 96.
Emergency stopping distance decreased 22.5 to 46 p cent. (2 200 words, 2 tables & fig.)

1926 **621 .338 (.73**
Electric Railway Journal, No. 4, July 24, p. 141.
New York railways experiments with **convertible ca** (1 200 words & fig.)

1926 **621 .338 (.73**
Electric Railway Journal, No. 5, July 31, p. 185.
Dedication of **interurban cars** in Georgia is civ event. (2 500 words & fig.)

Engineering & Boiler House Review. (London.)

1926 **621 .138.2 (.42**
Engineering & Boiler House Review, July, p. 3.
A modern **coal and ash handling plant.** (14 500 word & fig.)

1926 **621 .133**
Engineering & Boiler House Review, August, p. 76.
Feed water treatment and continuous sludge remova (1 600 words & fig.)

1926 **621 .1**
Engineering & Boiler House Review, October, p. 192.
DUNSTAN (A. E.). — **Fluid fuels.** (6 000 word & tables.)

Great Western Railway Magazine. (London.)

1926 **625 .13 (.42**
Great Western Ry. Magazine, July, p. 249.
TYERS (G.). — New **single-line tunnel** at Colwa (1 600 words & fig.)

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1926 **385. (09.3 (.42**
Journal of the Institute of Transport, June, p. 352.
BELL (R.). — A hundred years of **railway develo ment.** (8 400 words.)

1926 **656 .222.6 (09 (.68) & 656 .225. (09 (.6**
Journal of the Institute of Transport, June, p. 363.
WILLE (F.). — **Transhipping methods** of the Sou African Railways. (4 900 words & 1 table.)

urnal, Permanent Way Institution. (London.)

1926 625 .15

urnal, Perm. Way Inst., August, p. 194.

GURD (R.). — Diagrams for ascertaining **junction ds and radii.** (3 500 words, tables & fig.)

comotive, Firemen & Enginemen's Magazine. (Cleveland [Ohio].)

1926 385 .51 (.73)

c. Firemen & Enginemen's Mag., June, p. 487.

Railway labor bill becomes a law. (10 000 words.)

1926 621 .132.5 (.73)

c. Firemen & Enginemen's Mag., October, p. 329.

Three-cylinder mountain type locomotive equipped th McClellon type boiler. (1 900 words & fig.)

Mechanical Engineering. (New York.)

1926 621 .116 (.73)

echanical Engineering, June, p. 626.

Revisions and addenda to **boiler construction code.** 700 words & fig.)

1926 621 .116. (01

echanical Engineering, July, p. 703.

BAILEY (E. G.). — Limiting factors in reducing cess air in **boiler furnaces.** (4 500 words & fig.)

1926 621 .9 & 669 .1

echanical Engineering, July, p. 727.

MUDGE (J. B.). — The selection of proper material r **tool manufacture.** (2 300 words & fig.)

1926 621 .132.8 & 621 .335

echanical Engineering, August, p. 797.

LIPETZ (A. I.). — Transmission of power on **oil-gine locomotives.** (10 700 words & fig.)

1926 62. (01 & 621 .8

echanical Engineering, September, p. 893.

NICHOLAS (J. E.). — The influence of elasticity and rors in **tooth shape on stresses in gears.** (3 300 words, tables & fig.)

1926 62. (01 & 621 .99

echanical Engineering, September, p. 919.

CASE (G. S.). — **Stresses on bolts** — nut dimen-ons — wrench design. (5 600 words, 7 tables & fig.)

Proceedings, Institution of Civil Engineers. (London.)

1924-25 621 .116

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ROBSON (P. W.). — The large **water-tube boiler.** 21 000 words, 1 table & fig.)

1926 62. (01 & 669 .1

roceed., Institut. of Civil Eng., Vol. 221, p. 21.

DALBY (W. E.). — The **mechanical properties of teel.** (17 800 words, 3 tables & fig.)

1926 624 .1 (.42)

Proceed., Institut. of Civil Eng., Vol. 221, p. 173.

BENGOUGH (C. F.). — **High-level bridge,** Newcastle-upon-Tyne : Underpinning and repair of foundations of river piers. (11 600 words & fig.)

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1926 62. (01 & 621 .9

Proceed., Institut. of Mechan. Eng., February, p. 289.

HERBERT (E. G.). — The measurement of **cutting temperatures.** (15 000 words & fig.)

1926 62. (01 & 669 .1

Proceed. Institut. of Mechan. Eng., February, p. 347.

JENNINGS (W. M.). — An investigation of the **failure of screwed steelpipe joints.** (4 300 words, tables & fig.)

1926 621 .43

Proceed., Institut. of Mechan. Eng., March, p. 369.

CHORLTON (A. E. L.). — The high efficiency **oil-engine.** (14 000 words, 7 tables & fig.)

Proceedings, Institution of Railway Signal Engineers. (Manchester.)

1926 656 .253 (.42) & 656 .257 (.42)

Proceed., Institut. Ry. Signal Eng., Part I, February to [August, p. 29.

THORROWGOOD (W. J.). — **Four aspect colour light signals** and the phenomena connected with colour light signals. (9 800 words & fig.)

Railway Age. (New York.)

1926 625 .3 (.54)

Railway Age, No. 2, July 10, p. 47.

HALL (A. G.). — **Indian Railways** extended over historic Khyber Pass. (5 000 words & fig.)

1926 621 .137.1 (.73)

Railway Age, No. 2, July 10, p. 64.

Standard stoker engine placed on the tender. (900 words & fig.)

1926 625 .1 (.73)

Railway Age, No. 3, July 17, p. 87.

New second track on Rock Island produces marked savings. (3 000 words & fig.)

1926 656 .253 (.73)

Railway Age, No. 3, July 17, p. 98.

Train control installations approved. (3 400 words.)

1926 656 .254 (.73)

Railway Age, No. 3, July 17, p. 100.

Radio phone between locomotive and caboose. (800 words & fig.)

1926 621 .133.1 (.73) & 621 .132.5 (.73)

Railway Age, No. 3, July 17, p. 101.

Texas type locomotive show marked fuel economy. (1 000 words, 3 tables & fig.)

1926 **621 .335 (.73) & 621 .4 (.73)**
Railway Age, No. 3, July 17, p. 103.
N. Y., N. H. & H. acquires **73-foot gas-electric car.** (500 words & fig.)

1926 **621 .335 (.73) & 621 .4 (.73)**
Railway Age, No. 3, July 17, p. 104.
Combination motor car equipped for railway postal service. (800 words & fig.)

1926 **656 .1 (.73) & 656 .2 (.73)**
Railway Age, No. 4, July 24, p. 161.
MARKHAM (C. H.). — **Bus or train?** (1 000 words.)

1926 **625 .1 (.73)**
Railway Age, No. 5, July 31, p. 185.
Pennsylvania completes **15-mile cut-off** in Eastern Ohio. (3 000 words & fig.)

1926 **624. (0 (.73)**
Railway Age, No. 5, July 31, p. 195.
Burlington smooths out **bridge material problem.** (3 400 words & fig.)

1926 **625 .212**
Railway Age, No. 5, July 31, p. 202.
LITCHFIELD (N.). — **Axle failures** in cold weather. (3 500 words & fig.)

1926 **656 .253 (.73)**
Railway Age, No. 5, July 31, p. 205.
HOFFMAN (W. A.). — Florida East Coast installs **signals.** (1 600 words & fig.)

1926 **621 .132.3 (.44)**
Railway Age, No. 7, August 14, p. 276.
CHAMBON (M.). — French **four-cylinder Compound** 4-8-2 type locomotive. (1 800 words, 2 tables & fig.)

1926 **656 .253 (.73)**
Railway Age, No. 7, August 14, p. 287.
GAULT (P. M.). — **Train stop** without permissive wayside signals used on I. C. (2 800 words & fig.)

1926 **621 .132.8 (.73) & 621 .335 (.73)**
Railway Age, No. 8, August 21, p. 324.
Boston & Maine buys ten more **rail motor cars.** (1 400 words & fig.)

1926 **62. (01 & 621 .392**
Railway Age, No. 8, August 21, p. 331.
MOSS (H. H.). — Tests of trusses show strength of **welded joints.** (1 800 words, 2 tables & fig.)

1926 **621 .138.3 (.73)**
Railway Age, No. 8, August 21, p. 339.
RICHARDSON (L.). — Power utilization and **repair costs.** (1 000 words, 2 tables & fig.)

1926 **625 .142.2 & 691**
Railway Age, No. 9, August 28, p. 361.
HOWSON (E. T.). — Does decay injure **ties?** (2 300 words & fig.)

1926 **385 .51 (.73**
Railway Age, No. 9, August 28, p. 365.
Growth and present **status of employee represent**tion. (5 600 words & fig.)

1926 **621 .138 (.73**
Railway Age, No. 9, August 28, p. 371.
PACK (A. G.). — Importance of **motive power mai**tenance. (2 500 words.)

1926 **656 .211.6 (.73**
Railway Age, No. 9, August 28, p. 381.
Baltimore & Ohio inaugurates **bus** service in Ne York and Newark. (1 500 words & fig.)

Railway Mechanical Engineer. (New York.)

1926 **621 .132.5 (.73**
Railway Mechanical Engineer, July, p. 419.
4-12-2 locomotive for Union Pacific. (2 900 word 2 tables & fig.)

1926 **621 .132.8 (.47) & 621 .43 (.47**
Railway Mechanical Engineer, July, p. 425.
WITTKUHUS (B. A.).— **Diesel locomotive** with ge transmission. (2 900 words & fig.)

1926 **621 .136.1 (.73**
Railway Mechanical Engineer, July, p. 429.
Tenders of large capacity for the Great Norther (800 words & fig.)

1926 **625 .253 (.73**
Railway Mechanical Engineer, July, p. 431.
Report of the Air Brake Convention. Papers insulating air compressors, air brake hose couplir gages and threading and bending air brake pipes. (3 6 words & fig.)

1926 **621 .133**
Railway Mechanical Engineer, August, p. 472.
REHFUSS (L. A.). — **Combustion efficiency** in loc motive boilers. (3 500 words & fig.)

1926 **621 .133**
Railway Mechanical Engineer, August, p. 475.
Fuel Association presents interesting report. (2 2 words, 1 table & fig.)

1926 **621 .134.1 & 621 .135**
Railway Mechanical Engineer, August, p. 477.
LITCHFIELD (N.). — **Axle failures** in cold weathe (3 500 words & fig.)

1926 **621 .132**
Railway Mechanical Engineer, August, p. 481.
Examples of **recent locomotives** of the 2-10-0,2-10 and 2-10-4 types. (1 table.)

1926 **621 .132.5 (.7**
Railway Mechanical Engineer, August, p. 482.
C. N. builds **2-8-0 locomotives** from surplus materi (700 words, 1 table & fig.)

926 621 .133
lway Mechanical Engineer, August, p. 483.
rafting locomotives to secure increased efficiency.
00 words.)

926 625 .212
lway Mechanical Engineer, August, p. 485.
IAL (F. K.). — Increased iron wheel flange thick-
proposed. (4 200 words, 7 tables & fig.)

926 621 .133.8
lway Mechanical Engineer, August, p. 500.
RITTON (J.). — Setting valves of three-cylinder
motives. (3 500 words & fig.)

926 385 .587 (.73) & 621 .138.5 (.73)
lway Mechanical Engineer, August, p. 505.
o-ordinated production control. (2 300 words, 4 tables
ig.)

926 621 .134.5 (.73)
lway Mechanical Engineer, October, p. 587.
RMSTRONG (G. W.). — Lubrication of steam loco-
ives. (2 200 words, 4 tables & fig.)

926 621 .131.2 (.73)
lway Mechanical Engineer, October, p. 590.
Vhat is the locomotive of today? (12 000 words
ig.)

Railway Review. (Chicago.)

926 656 .261 (.73)
lway Review, No. 26, June 26, p. 1193.
OYD (G. E.). — Saving 100 000 car days a year.
00 words & fig.)

926 621 .14 (.73) & 656 .1 (.73)
lway Review, No. 26, June 26, p. 1199.
RUMBOWER (H. R.). — Private motors carry
t passengers. (2 800 words & fig.)

926 621 .14 (.73) & 656 .1 (.73)
lway Review, No. 26, June 26, p. 1203.
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00 words.)

926 656 .24 (.73)
lway Review, No. 26, June 26, p. 1211.
Millions cut from freight claims. (8 200 words.)

926 621 .13 (01
lway Review, No. 1, July 3, p. 5.
ocomotive developments, 1925-1926. (2 800 words
ig.)

926 625 .143.1 (.73)
lway Review, No. 1, July 3, p. 8.
Modified rail section gives longer life. (600 words
ig.)

926 385 .57
lway Review, No. 1, July 3, p. 14.
VOODRUFF (R. E.). — The selection of men for
cers. (2 800 words.)

1926 656 .222
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DROEGE (J. A.). — Time schedules and dispatching methods. (2 700 words.)

1926 621 .33 (.54)
Railway Review, No. 2, July 10, p. 41.
STEAD (A. L.). — Bombay suburban line electrifies. (3 200 words & fig.)

1926 625 .151 (.73) & 625 .173 (.73)
Railway Review, No. 2, July 10, p. 45.
WILSON (J.). — How to renew slip switches. (1 500 words & fig.)

1926 656 .222.6
Railway Review, No. 2, July 10, p. 47.
Operating freight trains efficiently. (4 700 words.)

1926 621 .13 (01 (.73)
Railway Review, No. 2, July 10, p. 51.
More power for less capital. (3 700 words & fig.)

1926 656 .256.3
Railway Review, No. 2, July 10, p. 65.
SPERRY (H. M.). — Automatic signals on single track. (1 600 words & fig.)

1926 621 .137.1 (.73)
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1926 621 .133.8 (.73)
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Standardization of water columns. (1 000 words & fig.)

1926 625 .142.2 (.73) & 691 (.73)
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ROBINSON (E. F.). — Making treated ties last longer. (5 200 words & fig.)

1926 385. (09.3 (.73)
Railway Review, No. 3, July 17, p. 83.
DILLON (C.). — Missouri Pacific puts on a show. (2 600 words & fig.)

1926 656 .223.2 (.71)
Railway Review, No. 3, July 17, p. 97.
Capacity car loading is needed. (2 600 words.)

1926 621 .131.2
Railway Review, No. 3, July 17, p. 100.
EKSERGIAN (R.). — Locomotive power rating and tractive force. (7 200 words & fig.)

1926 313: 656 .28 (.73)
Railway Review, No. 4, July 24, p. 123.
A very fine record for safety. (1 900 words.)

1926 656 .256.3 (.73)
Railway Review, No. 4, July 24, p. 127.
WOLLNER (W. S.). — N. W. P. has a thoroughly safe tunnel. (1 500 words & fig.)

1926 656 .254 (.73)
Railway Review, No. 5, July 31, p. 156.
LEASON (J. A.). — **Loud speakers direct trains.** (400 words & fig.)

1926 621 .33 (.68)
Railway Review, No. 5, July 31, p. 163.
STEAD (A. L.). — **Electrification pierces darkest Africa.** (1 900 words & fig.)

1926 625 .244 (.73)
Railway Review, No. 5, July 31, p. 179.
Refrigerator cars tested in fruit service. (3 000 words & fig.)

Railway Signaling. (Chicago.)

1926 656 .253 (.73)
Railway Signaling, July, p. 264.
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1926 656 .257 (.73)
Railway Signaling, August, p. 298.
ROBERTS (H. W.). — North Shore Line **installs two electric interlockers.** (1 200 words & fig.)

1926 656 .253 (.73)
Railway Signaling, August, p. 301.
GAULT (P. M.). — **Train stop** without permissive wayside signals used on I. C. (2 900 words & fig.)

1926 656 .253 (.73)
Railway Signaling, August, p. 307.
I. C. C. approves G. R. S. **train stop** on Atlantic Coast Line. (4 000 words.)

1926 656 .253 (.73)
Railway Signaling, August, p. 313.
HOFFMAN (W. A.). — A. C. **light signals** installed on 347 miles of Florida East Coast. (2 000 words & fig.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1926 621 .131.3 & 656 .221
Annali dei lavori pubblici, giugno, p. 482.
BARAVELLI (P.). — Sull' uso del **dinamometro d'inerzia per esperienze di trazione ferroviaria.** (3 600 parole & fig.)

1926 625 .253
Annali dei lavori pubblici, agosto, p. 727.
Perfezionamenti nella **frenatura.** (1 300 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1926 624 .7 (.45) & 721 .9 (.45)
Rivista tecnica delle ferrovie, 15 luglio, p. 1.
RIPANTI (E.). — **Costruzione di impalcature di cemento armato** in sostituzione delle travate metalliche, Musone-Potenza-Chienti e Tenna sulla linea Ancona-Castellammare A. (2 200 parole, 2 quadri & fig.)

1926 656 .23 (.43)
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1926 656 .254 (.45)
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1926 62. (01
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1926 621 .335 (.45)
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1926 621 .133.7 (.45)
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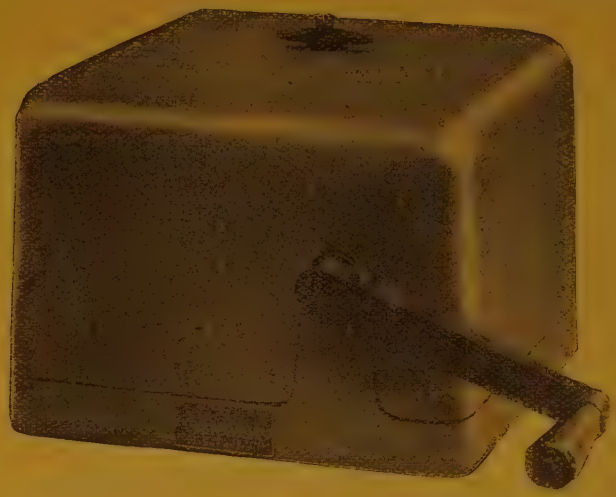

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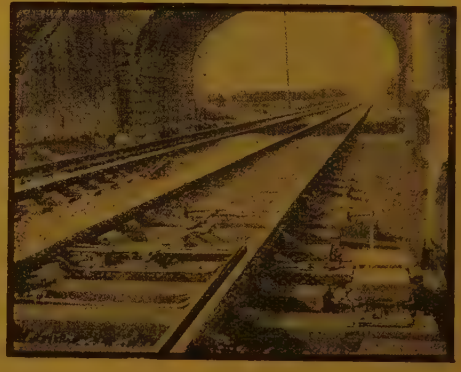

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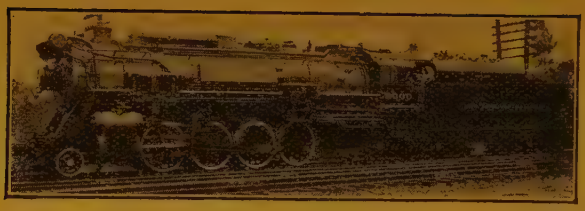

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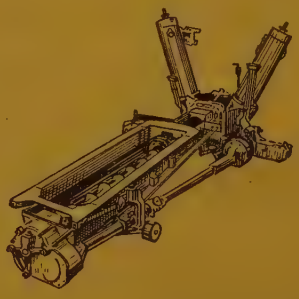

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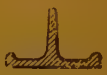

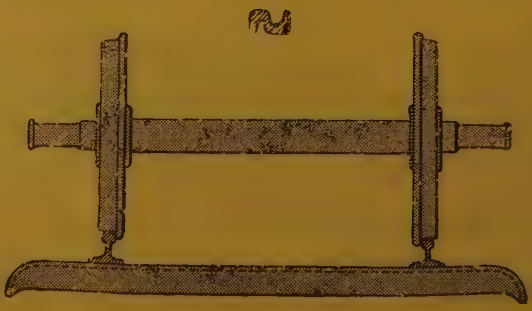

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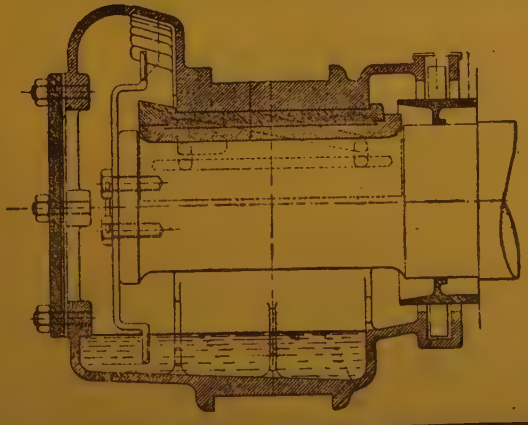

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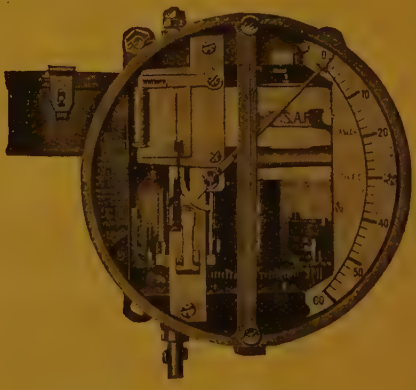

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